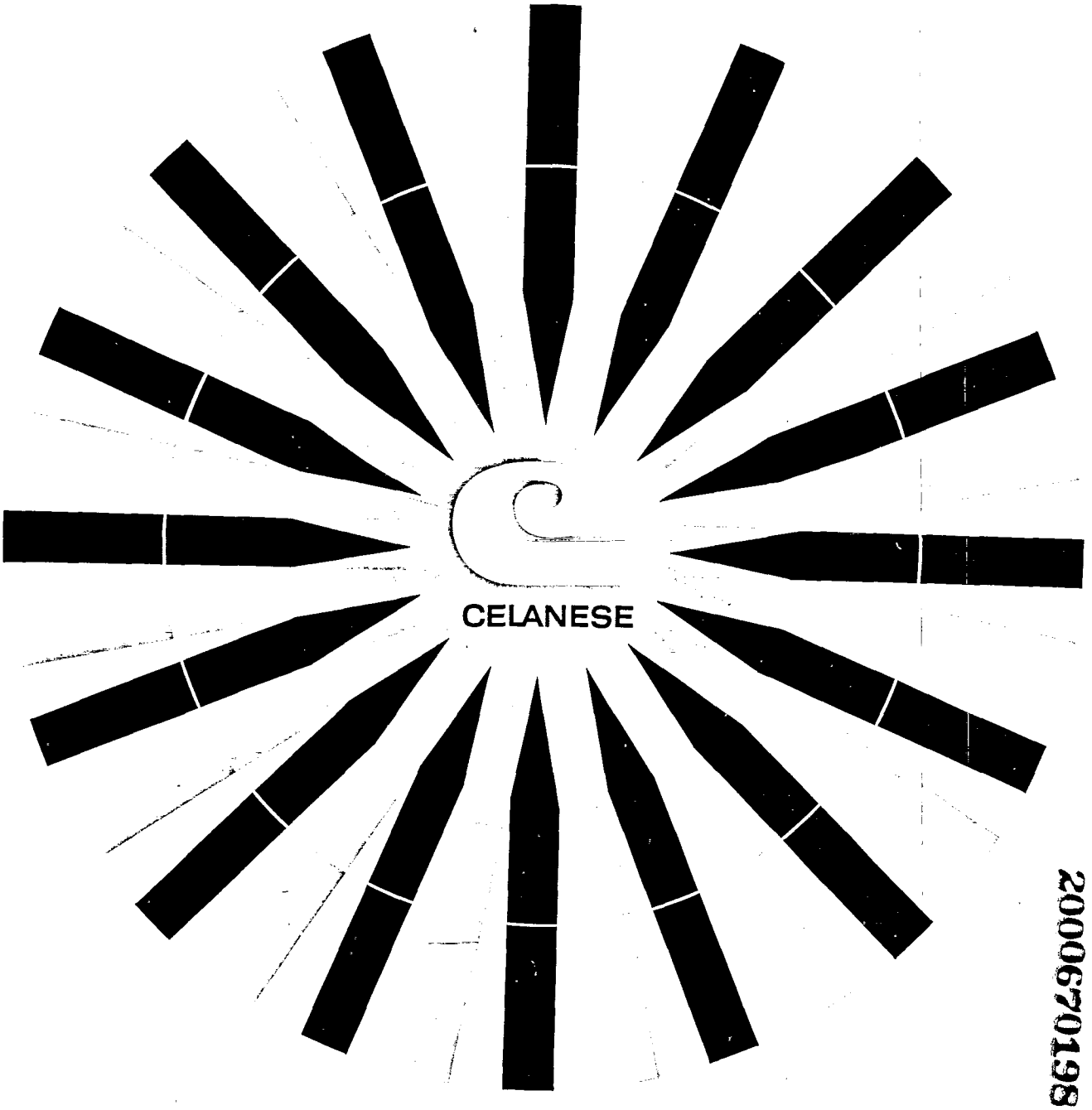
CELANESE
FIBERS
MARKETING
COMPANY



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WORLD SMOKING PRODUCTS

WORLD SMOKING PRODUCTS
CELANESE FIBERS MARKETING COMPANY
Box 1414 • Charlotte, N.C. 28232 • Telephone 704–554-2776
A Division of Celanese Corporation

INTRODUCTION

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INTRODUCING CIGARETTE FILTER TOW .....

Acetate tow, the major cigarette filter material in use today, has gained worldwide acceptance by significantly reducing the "tar" (particulate matter) and nicotine delivery of smoke without adversely affecting smoker satisfaction. In addition to its filtration properties, acetate tow is clean, nontoxic, odorless, and tasteless. It can be easily and economically converted into filters with precisely controlled physical and filtration properties. Because acetate tow is continuous, it can be drawn directly from the bale and processed into filters in a single continuous, high-speed operation.

Celanese Fibers Marketing Company and five worldwide affiliates or subsidiaries of Celanese Corporation (USA) are leading suppliers of acetate tow custom designed to meet the exacting functional requirements of cigarette manufacturers around the world. Let us introduce you to our facilities, our marketing and technical organizations, and the filter tow products and processes developed to assist you in producing filters that satisfy the specialized demands of your cigarette products.

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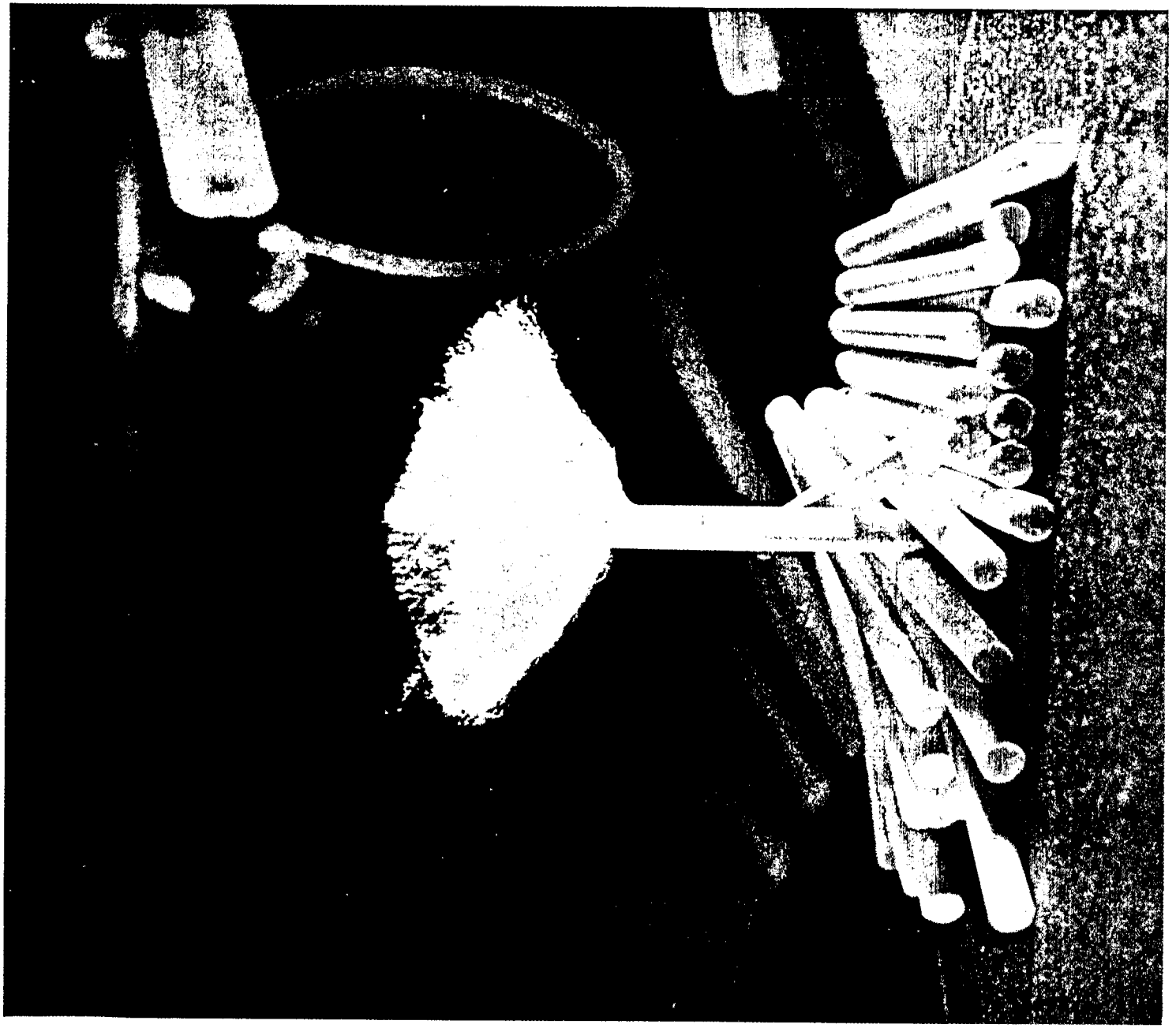
WSP



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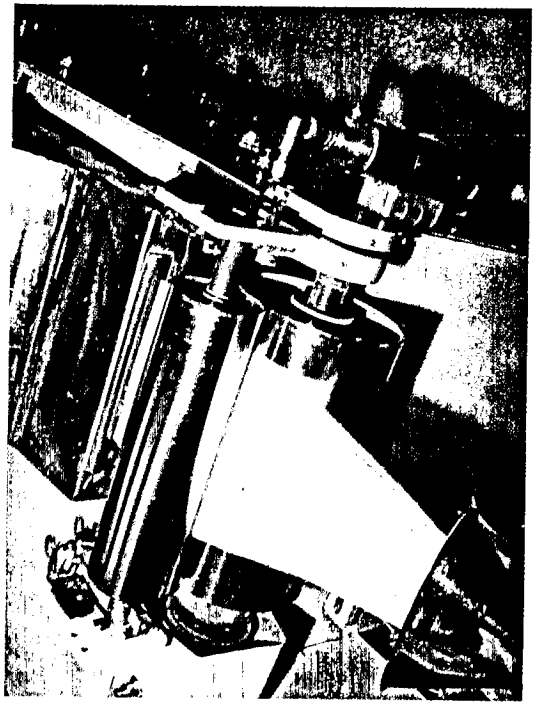
WSP1
2

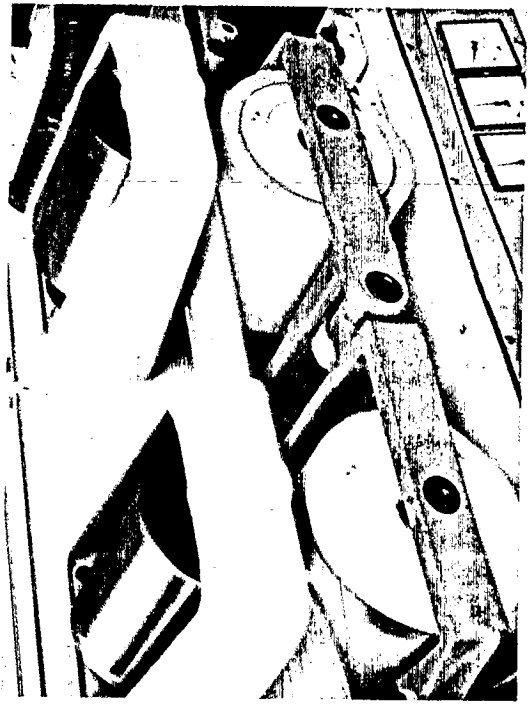
INTERNATIONAL SCOPE OF OPERATIONS .....

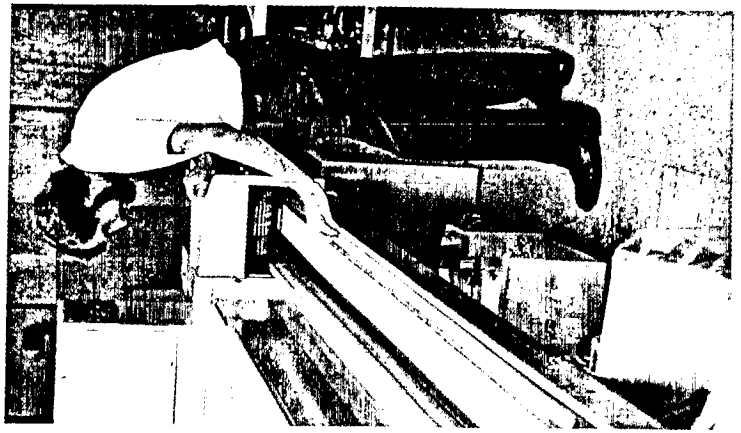
Celanese Corporation (USA), among the world's largest producers of man-made fibers, is also engaged in the production of chemicals, plastics, and specialties. The corporation and its affiliates operate over 70 plants around the world.

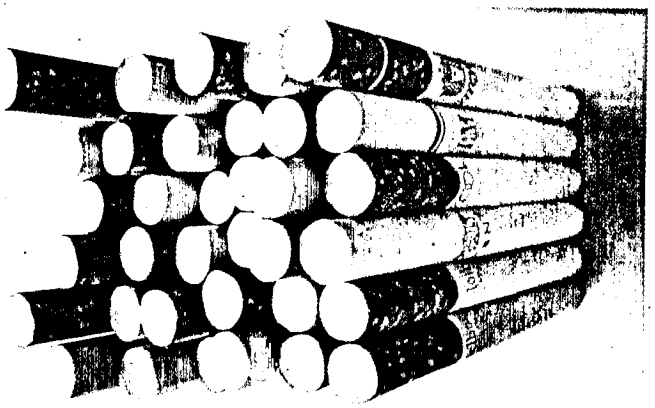
The rapid growth of Celanese is based largely on the technological and manufacturing expansion in its fiber business, reflecting modern man's dependence on billions of pounds of versatile man-made fibers.

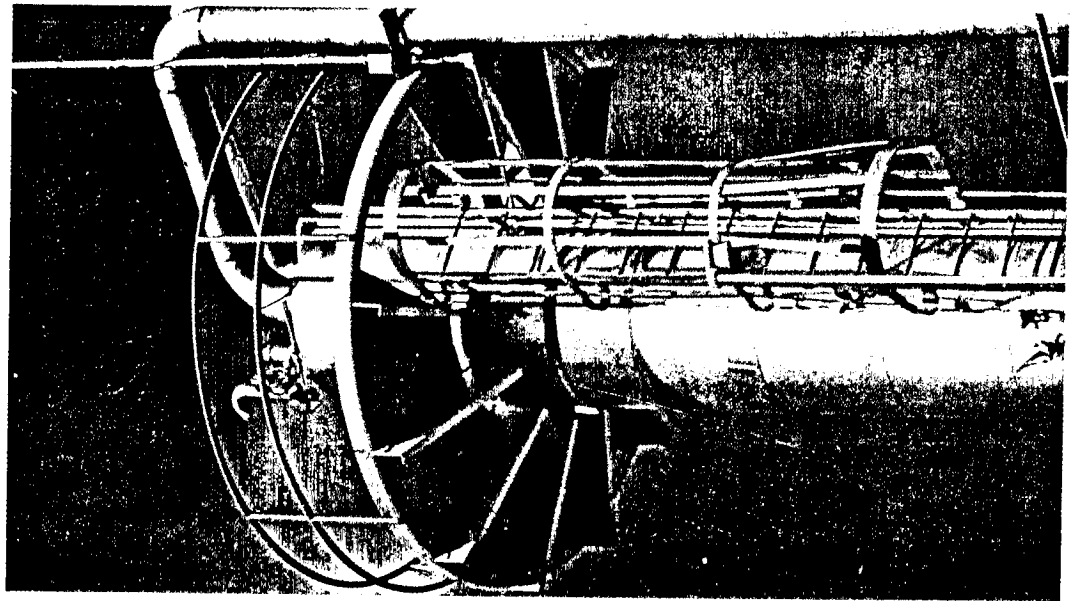
Founded on the pioneering research of Drs. Henry and Camille Dreyfus, Celanese as a manufacturing concern began its operations in Cumberland, Maryland, in 1924. Beginning with the first acetate plant built in the U.S., Celanese soon became established as a strong contributor of cellulose-based fiber products. This leadership continues today, furthered by the corporation's market-oriented manufacturing and technical organization, which, in spite of vast diversification, insures a steady flow of quality products tailored to our customers' present and future needs.











ENTRY INTO CIGARETTE TOW MARKET .....

The acetate filter tip emerged in the 1950's. Smokers rapidly accepted the clean fiber tip, which today has become the standard. Manufacturers found that they reaped the double benefits of greater consumer satisfaction and cost savings accrued from the reduced amount of tobacco in each cigarette.

Currently, about two-thirds of the world's cigarette production is filter-tipped, with many countries' output approaching 100%. The most significant growth in cigarette filters has been in tips manufactured from acetate fiber. From a marketing standpoint, acetate filters offer the advantages of improved taste, firmness, and appearance. From a manufacturing standpoint, acetate tow is easily and economically worked to produce filters with a wide range of filtration characteristics—filters that are suitable for processing on the most modern high-speed tipping machinery.

Celanese entered the cigarette-filter market as a supplier of acetate tow in the mid-1950's. Investigation of existing processing equipment soon revealed the need for a more economical, more reliable method of making filters from tow. Celanese launched an intensive development program which produced the Celanese Threaded-Roll Tow-Opening System, now licensed to major cigarette manufacturers in over 70 countries throughout the world.

Celanese also produces and markets a full line of plasticizers, trademarked Fiberset®, used in filter-rod manufacturing operations. The complement of plasticizers added to the product line in 1978 is described in bulletin WSP 5.60.

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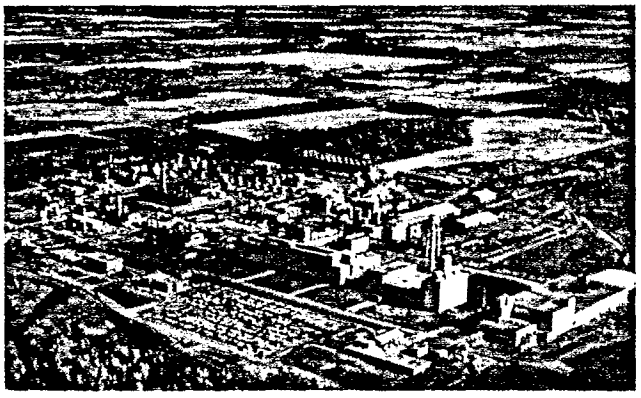
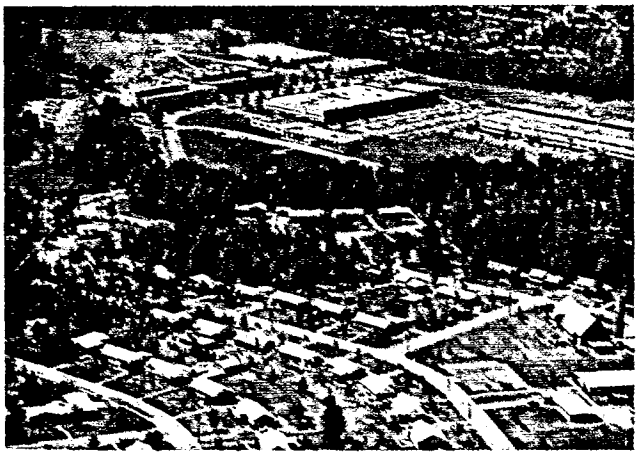
The Celco plant of Celanese Fibers Company in Narrows, Virginia

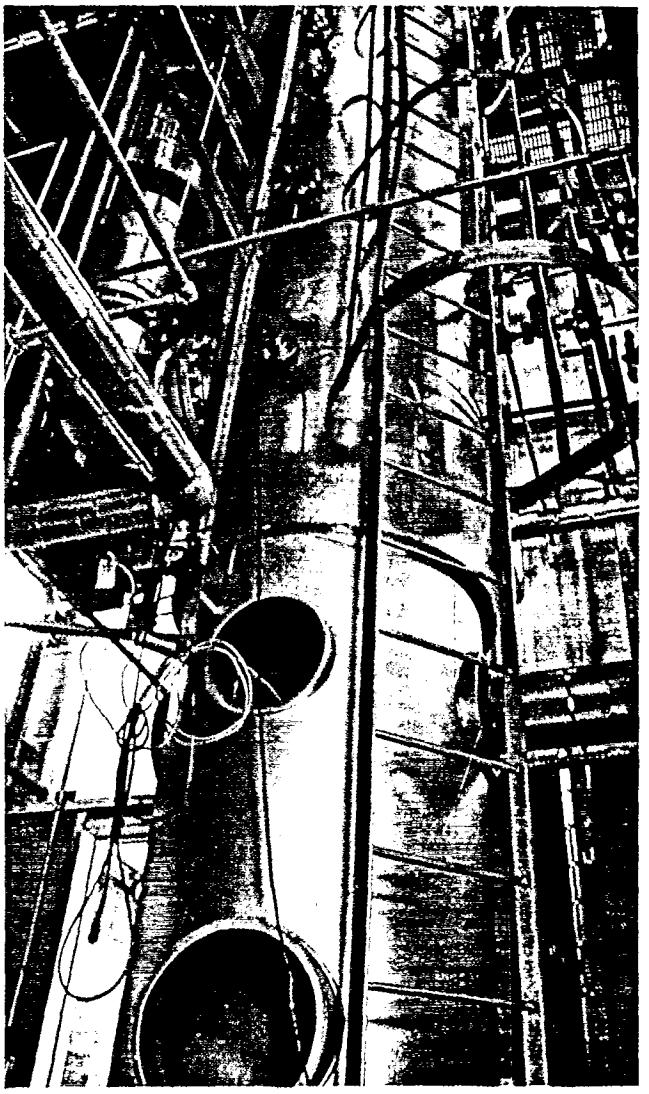


Celanese Canada's Edmonton, Alberta, plant

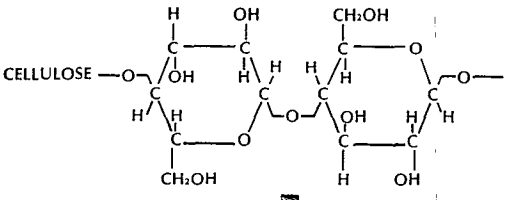
Lanaken, Belgium, plant of Amcel Europe S.A.

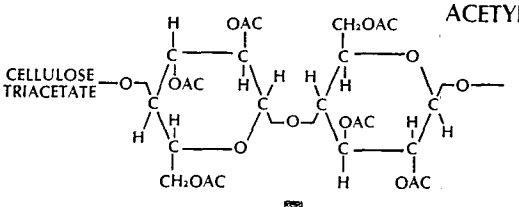


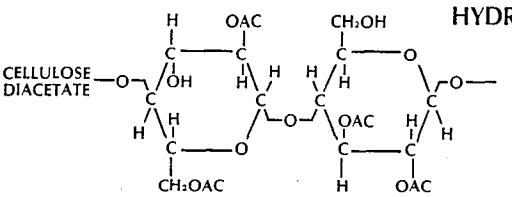
Fibers Technical Center in Charlotte, North Carolina



A SIMPLE EQUATION .....







..... A COMPLEX PROCESS

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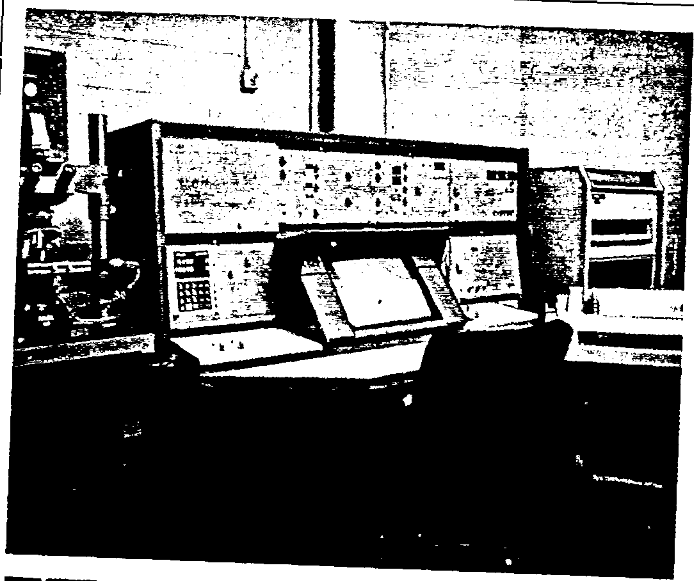
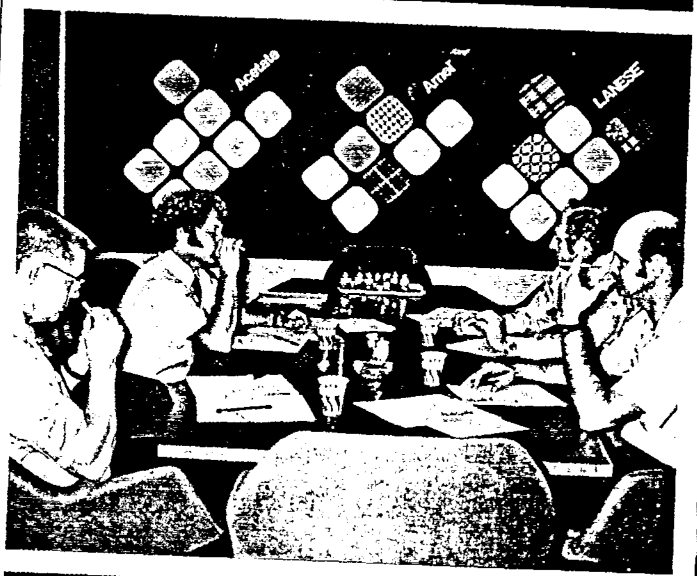
MANUFACTURING AND RESEARCH .....

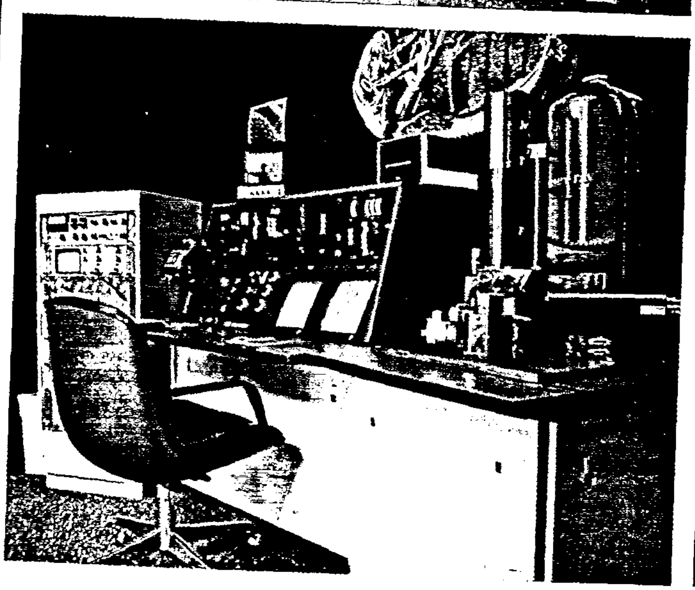
Celanese Fibers Company is a leading producer of acetate fibers. With headquarters in Charlotte, North Carolina, the company operates three acetate fiber plants in the U.S. The Celco plant located in Narrows, Virginia, produces acetate tow, the fiber product used in most cigarette filters. This facility is the world's largest producer of cellulose acetate flake, the intermediate raw material for acetate fibers. Another plant in Rock Hill, South Carolina, also produces cellulose acetate flake and is fully equipped to produce acetate tow.

Celanese and its subsidiaries' and affiliates' plants in Edmonton, Alberta, Canada; Lanaken, Belgium; Ocotlan, Mexico; Cali, Colombia; and Valencia, Venezuela, are major suppliers of acetate filter tow. Filters of Celanese acetate are found in cigarettes around the globe.

Exploratory research in filtration is conducted by the R&D laboratories of Celanese Fibers Company at the Fibers Technical Center in Charlotte. Basic studies include physical, chemical, and biological phenomena involved in the mechanisms of filtration and the selective removal of smoke components. Manufacturing operations are supported by laboratory and pilot-plant R&D fiber-production units and product-evaluation facilities.







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THE TOTAL MARKETING CONCEPT .....

Celanese Fibers Marketing Company is the marketing arm of the Celanese Fibers Group, handling sales of fibers produced by Celanese Fibers Company. The company is geared to the "total marketing" concept, with sales, technical service, and product development staffs functioning as an integral team.

Charlotte, North Carolina, is headquarters for World Smoking Products, the filter products sales force for both U.S. domestic and worldwide export. Sales organizations are also maintained in Brussels, Belgium, covering the Amcel Europe territory, and in Canada, Mexico, Colombia, and Venezuela. Sales personnel are technically trained and experienced in cigarette filtration technology to provide maximum assistance to filter manufacturers.

The sales staffs in each of the above locations are supported by a technical organization that generates the technology required to use Celanese fibers effectively. One unit, the Marketing Technical Department (MTD), located at the Fibers Technical Center in Charlotte, is devoted entirely to product/process development and technical service in the area of cigarette filter tow. This organization continually develops and monitors new concepts in filter tows, processing systems, auxiliary equipment, filter design, testing equipment and methods, and other advances that help keep customers abreast of industry trends.

Technical service is provided directly to customers in all parts of the world. This service takes many forms—from equipment installation through performance testing of the filters.

Marketing and technical personnel are together committed to a continuing program designed to provide customers with a flow of up-to-date information through comprehensive technical presentations and technical literature, as well as through personal contact.

IN CONCLUSION .....

This introduction is intended as a capsule view of Celanese's involvement in the cigaratte industry as a supplier of filter materials: our products, organization, services, and locations.

Prospective licensees of the Celanese Threaded-Roll Tow-Opening System may contact either of the offices listed below. World Smoking Products can supply current economic data for your area. Equipment, labor, materials, and space requirements are described in WSP 2. Celanese can provide complete technical assistance for the installation and start-up of the rodmaking operation. Training of personnel for rodmaking and quality control is also provided during the start-up phase. Highly skilled engineers are available to provide guidance in the design of acetate filters with the best balance of properties for your cigarette products. This overall technical support and coordination of efforts is what we call "total marketing."

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or
AMCEL CO., INC.
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U.S.A.
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Cable: AMCEL FLTS, Charlotte, (North Carolina)
Telex: 575141

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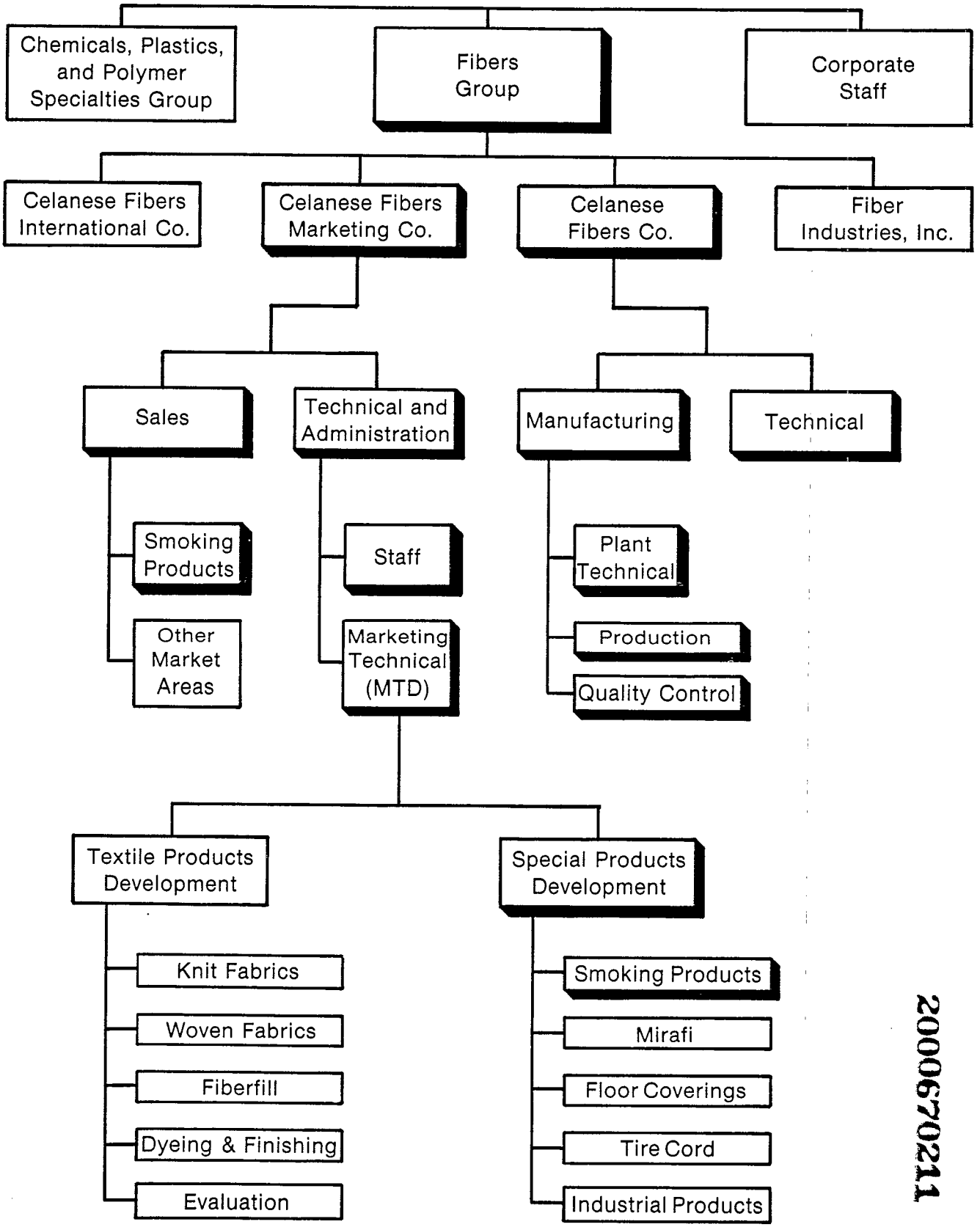
Cable: AMCEL BRUSSELS
Telex: 22.126

Edition 2. Issued November 1979.

CELANESE CORPORATION



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TECHNICAL SERVICE CAPABILITIES

- INSTALLATION ASSISTANCE
- PERSONNEL RODMAKING TRAINING
- RODMAKING START - UP ASSISTANCE
- REGULAR CUSTOMER VISITS
- TOW ITEM SELECTION AND ECONOMICS
- NEW FILTER DEVELOPMENT
- NEW TEST AND AUXILIARY EQUIPMENT DEVELOPMENT

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SOME TOW PRODUCERS:

- Have factories in only one or two other countries.
- Offer a less extensive product line.
- Do not conduct as much research in the field of filter technology.
- Do not provide as much new product development support.
- Do not offer the rod manufacturer as much technical service as Celanese.
- Do not produce their own acetate flake.

CELANESE OFFERS:

- Seven tow factories in six countries.
- Over 100 different tow items to choose from.
- Extensive research into new products and processes.
- Highly skilled technical service team.
- Extensive new product development support.

PAST INVOLVEMENT

- Leading Supplier of Acetate Tow
- Seven Tow Factories in Six Countries
- Extensive Research into New Products and Processes
- Extensive New Product Development Support

PAST INVOLVEMENT - (Continued)

- Threaded Roll Opening Process
- Amcel Digital Pressure Drop Tester
- Introduction of Fiberset® Plasticizers
- Instrument Development
- Test Method Development

PRESENT INVOLVEMENT

Customer - Related Assistance

New Filter Products

Laboratory Tests

Filter Ventilation

CIGARETTE TOW DEFINITIONS

DENIER - A textile term representing the weight in grams of 9,000 meters of yarn.

dpf - Denier per filament

3.3 dpf means that 9,000 meters of one filament weighs 3.3 grams.

TOTAL CRIMPED DENIER - The denier of the entire tow band.

44,000 total denier means that 9,000 meters of tow cut under a 5-pound load would weigh 44,000 grams.

TYPE F DULL - "Y" cross section, white (pigmented) tow. One tow band of 3.3F/44 contains approximately 13,500 filaments.

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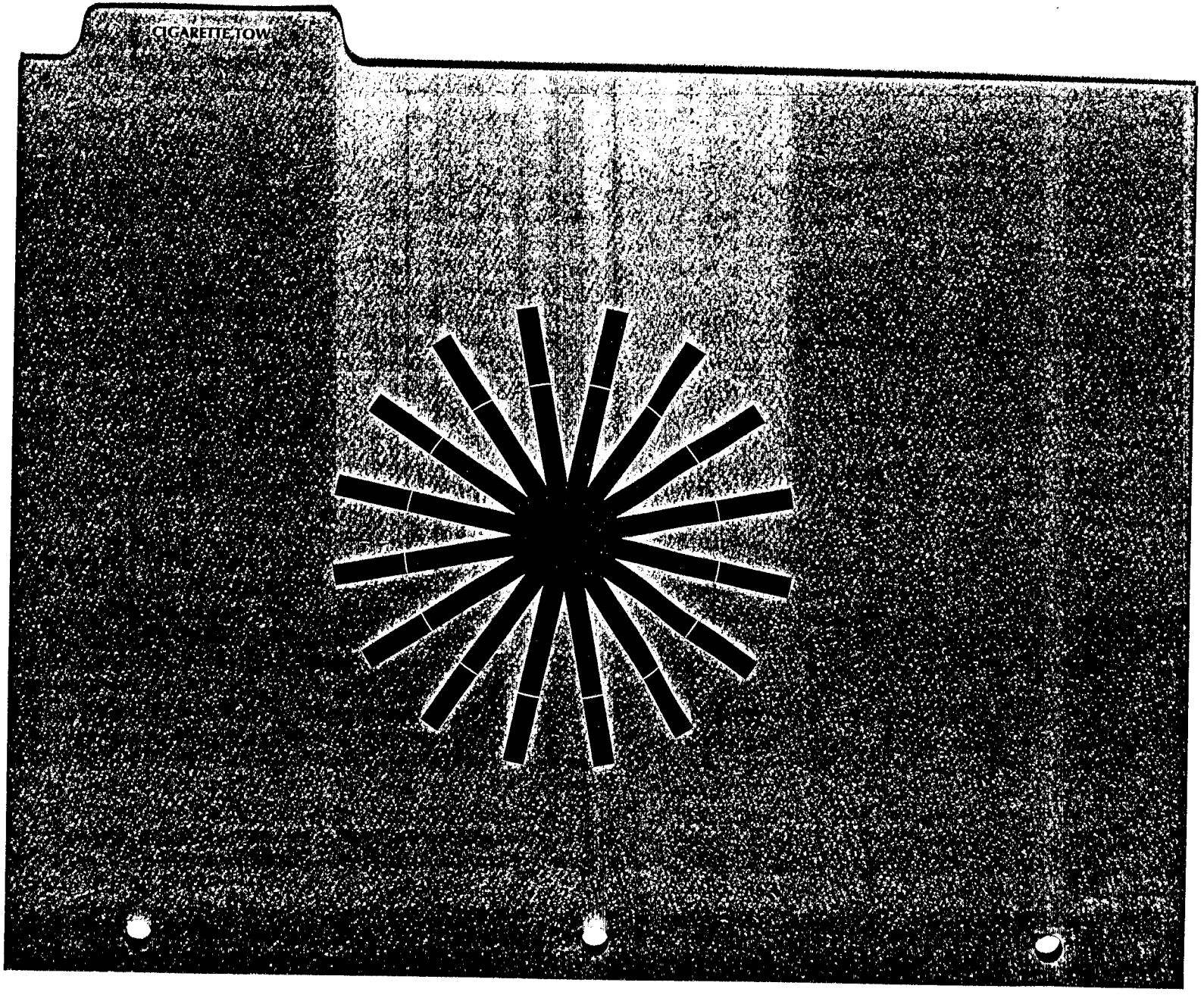
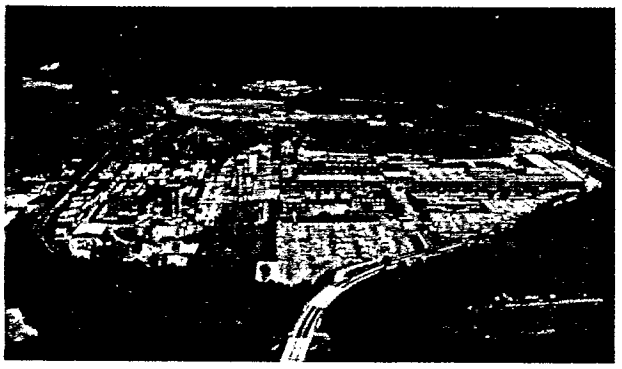


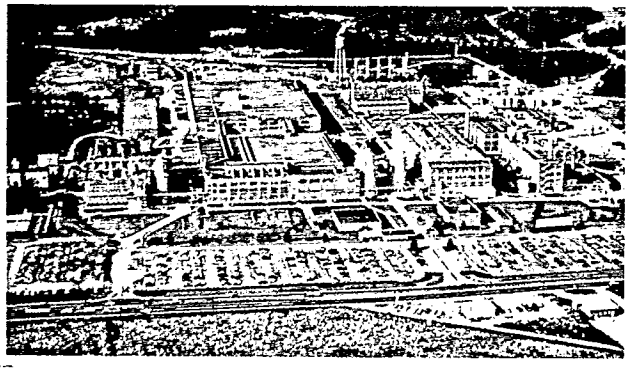
CELLULOSE ACETATE CIGARETTE TOW PRODUCTION

Cellulose acetate, or secondary acetate, is an ester formed by the action of glacial acetic acid on cellulose derived from wood pulp. The main chemical reaction is called acetylation and forms a viscous intermediate product known as cellulose triacetate. The triacetate is converted into the secondary acetate by partial hydrolysis. Precipitation, washing and drying steps then convert the viscous secondary acetate into a dry flake form suitable for further processing into cigarette tow.

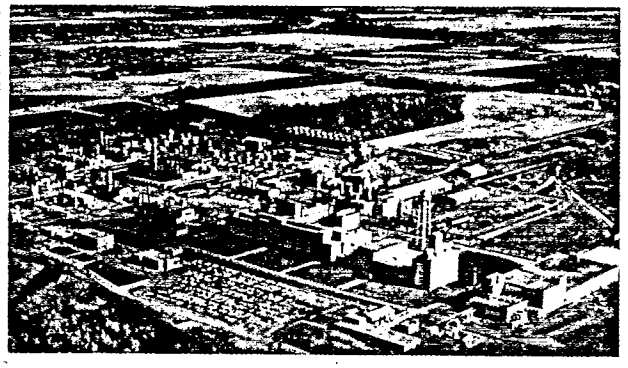
Acetate tow is made by extruding an acetone solution of cellulose acetate through minute holes into a heated chamber where the volatile solvent is removed. The solution is pumped at a precisely controlled rate through a perforated disc called a spinnerette. The fine strand formed by each hole is a filament. Filaments emerging from the spinnerette pass through a column of hot air where the solvent evaporates and the filaments are hardened and stretched. A tow is formed by combining the output of a large number of spinnerettes and crimping this collection of filaments to form an integrated band of continuous fibers. The tow is then dried and baled.



Celco Factory at Narrows, Virginia



Celriver Factory at Rock Hill, South Carolina



Celanese Factory at Edmonton, Alberta, Canada

Lanaken, Belgium, Factory

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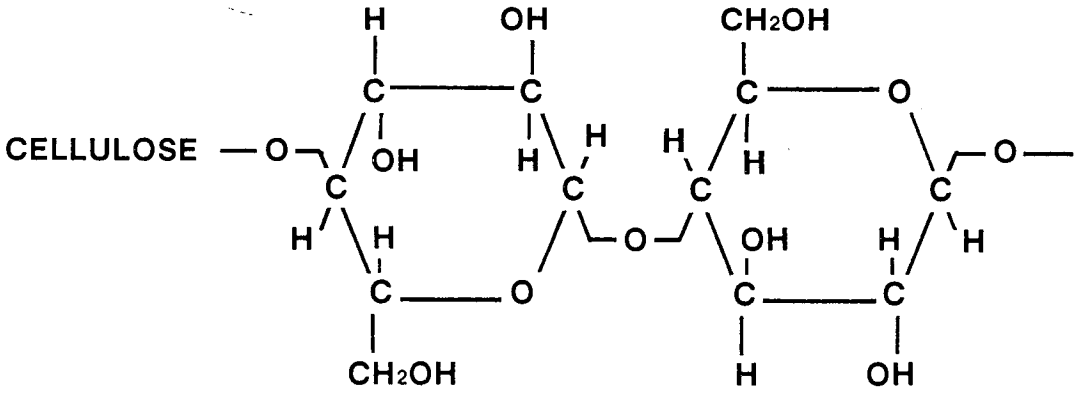
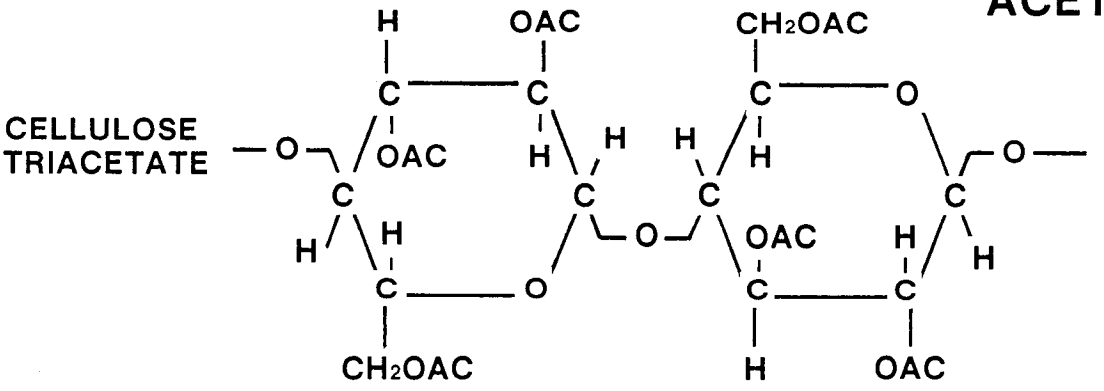
CELLULOSE ACETATE CIGARETTE TOW PRODUCTION

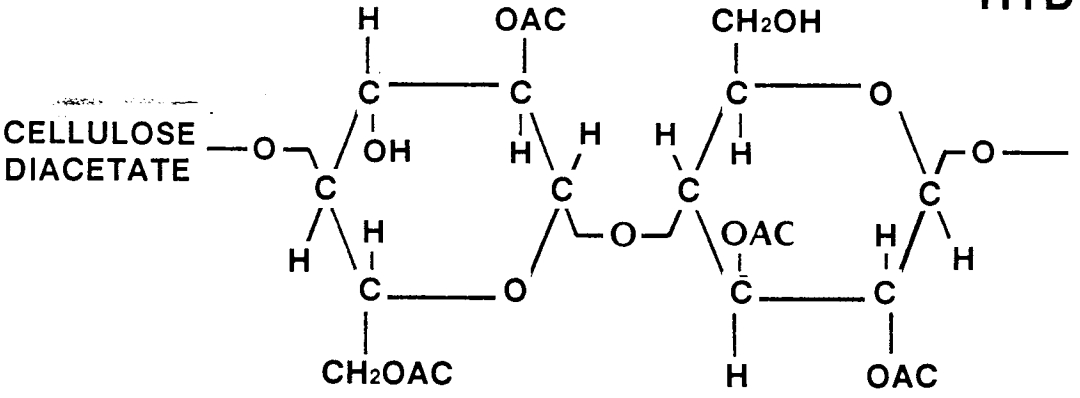
- MANUFACTURE OF ACETATE FLAKE
- PRODUCTION OF CIGARETTE TOW



ACETYLATION



PARTIAL HYDROLYSIS



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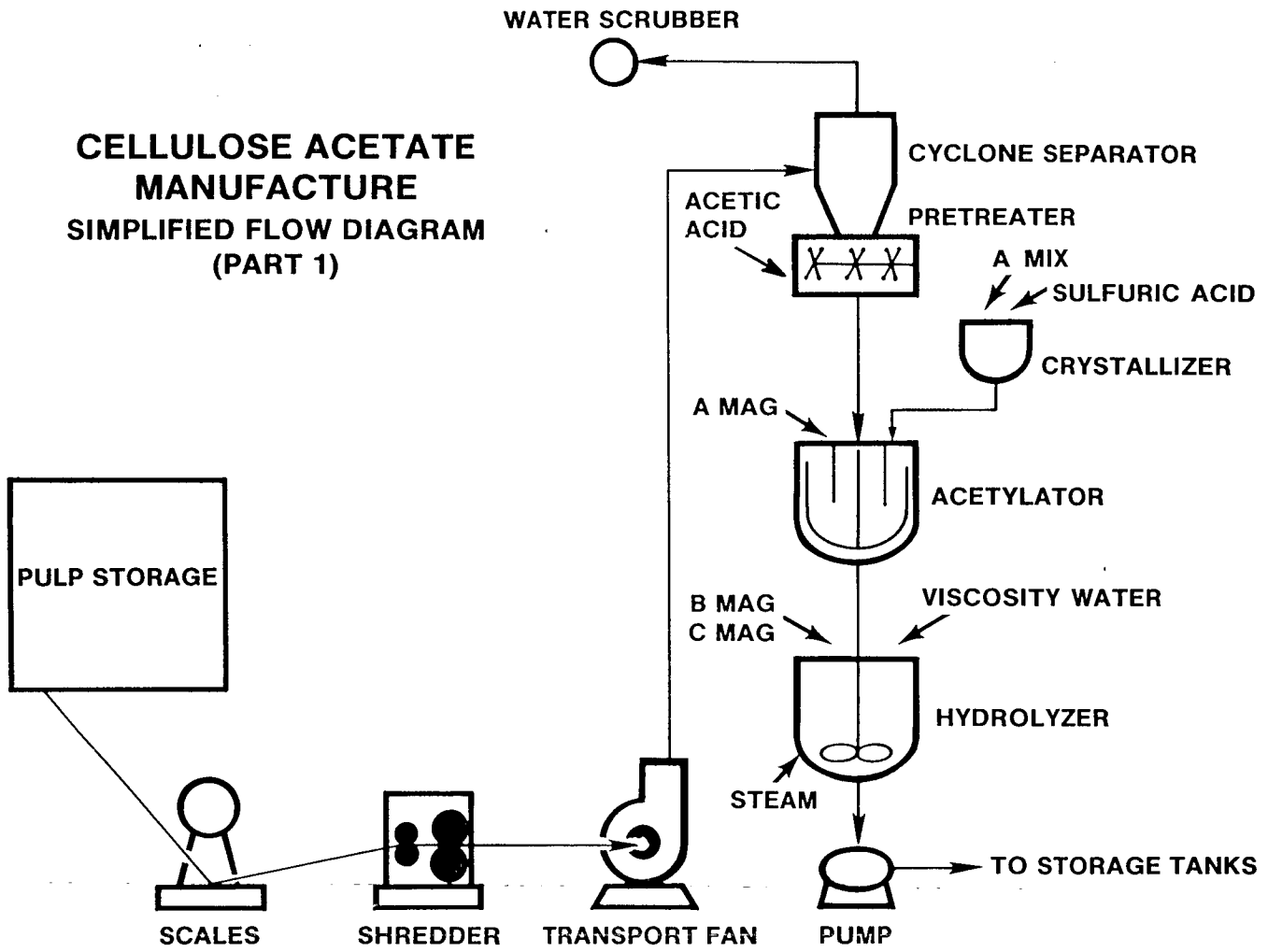
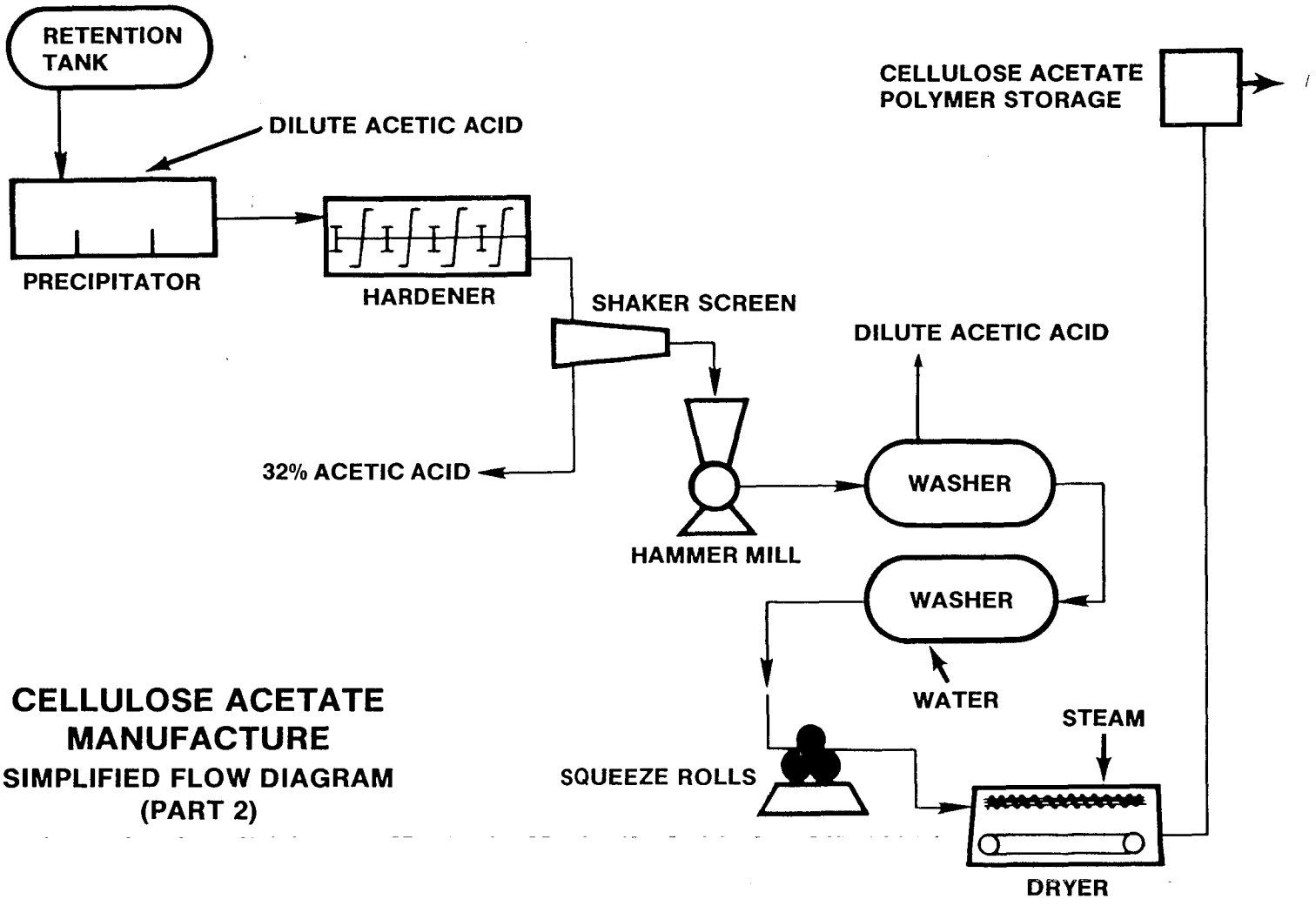
CELLULOSE ACETATE MANUFACTURE

SIMPLIFIED FLOW DIAGRAM (PART 1)

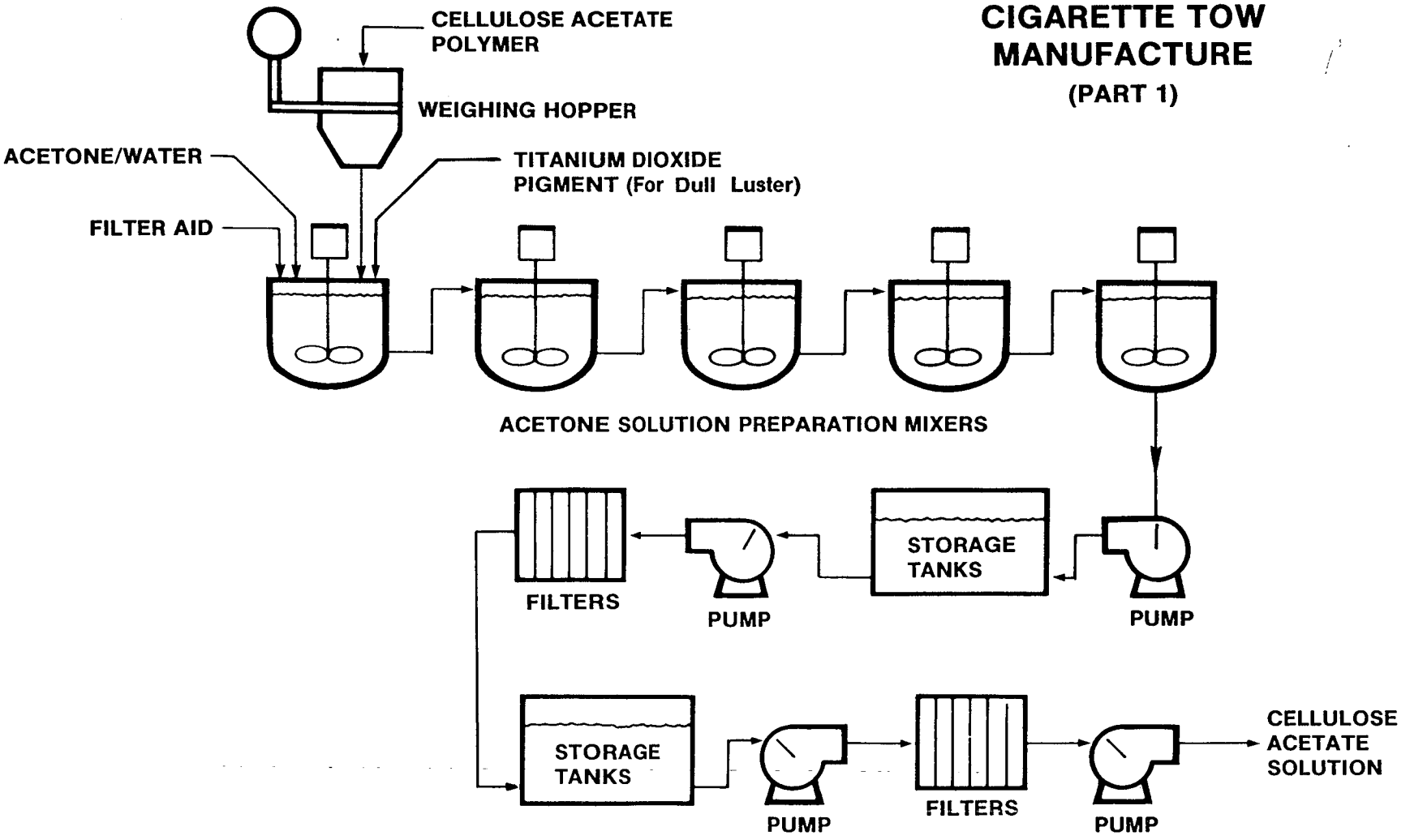




CELLULOSE ACETATE MANUFACTURE

SIMPLIFIED FLOW DIAGRAM (PART 2)

CIGARETTE TOW MANUFACTURE
(PART 1)



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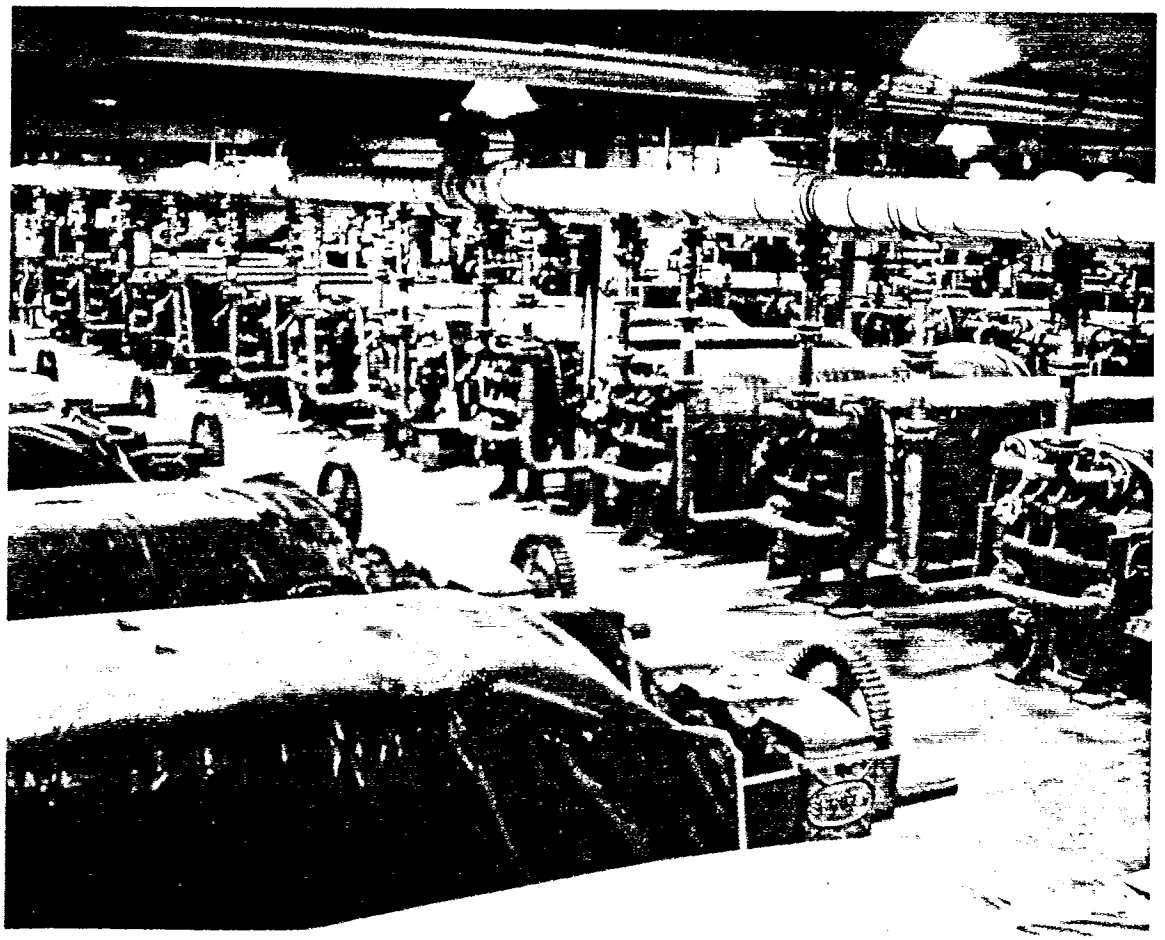
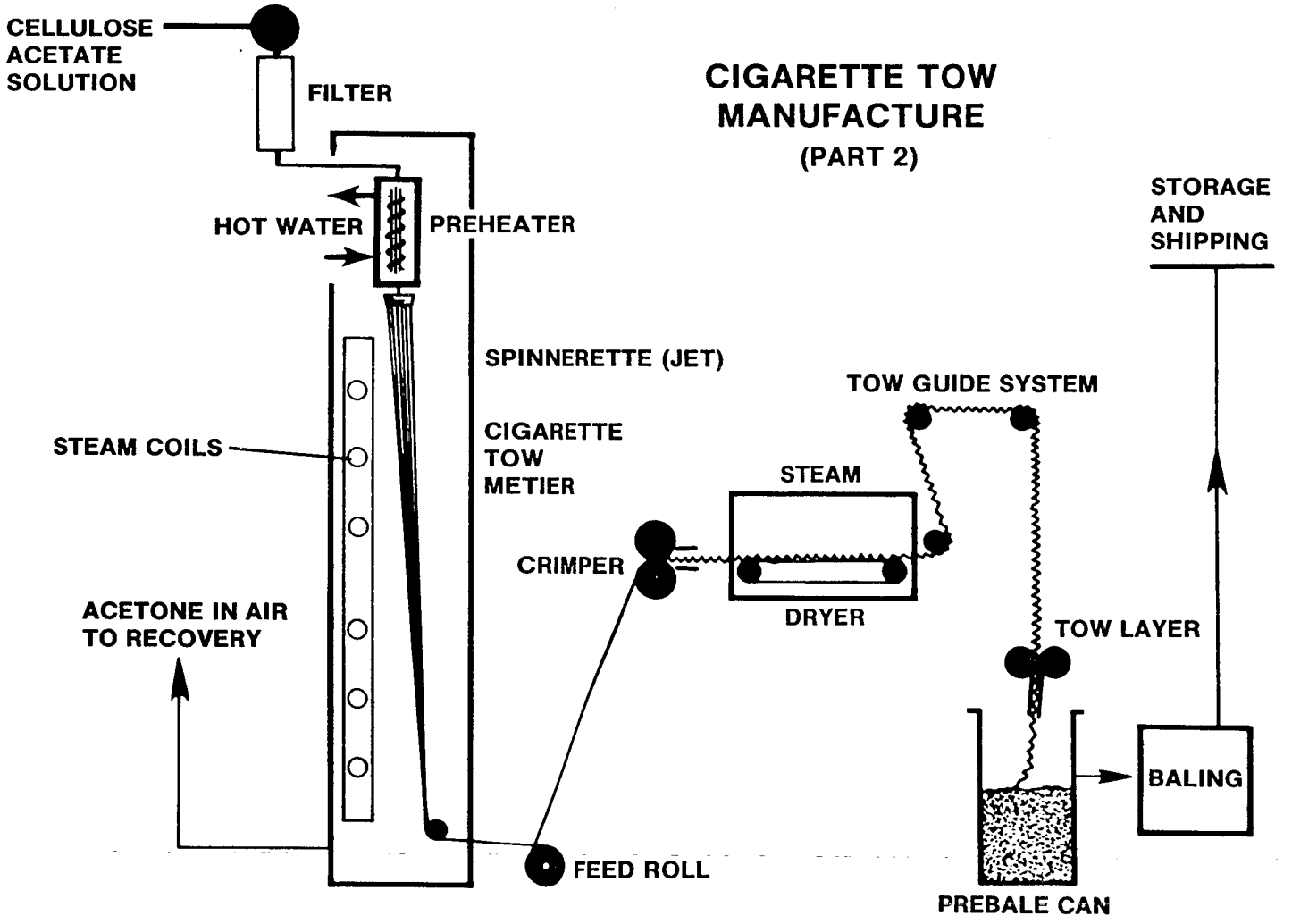
POLYMER SOLUTION FILTRATION





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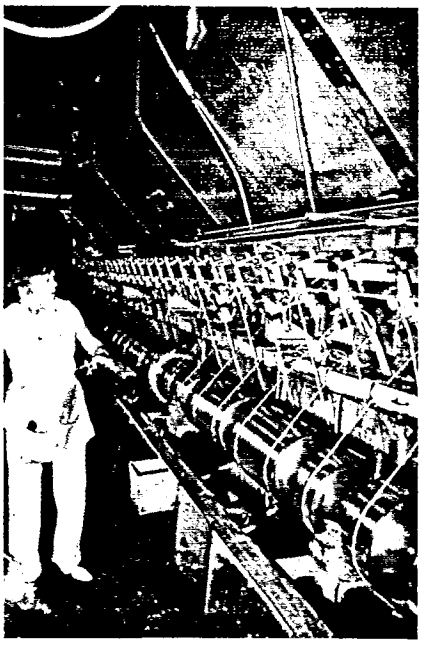
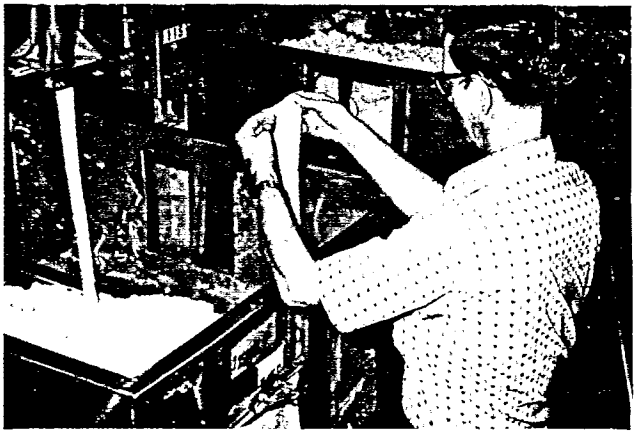


Cigarette tow extrusion machine



Examining tow before baling

Adjusting pressure on crimper

Baling cigarette tow

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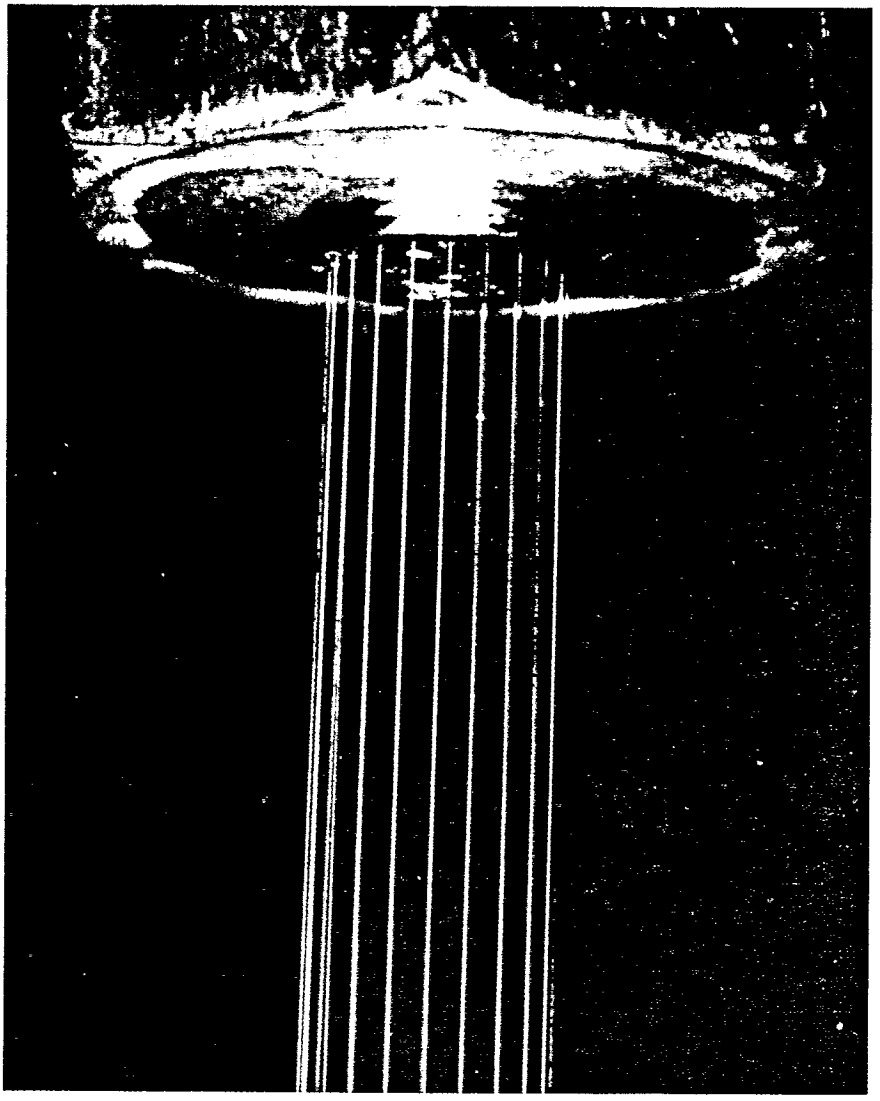
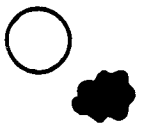
EXTRUSION OF FIBERS

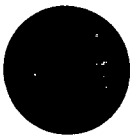


CIGARETTE TOW SPINNERETTES (JETS)

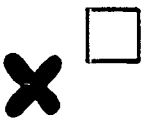
RELATIVE SHAPES AND SIZES



30 - 100 µ



HUMAN HAIR
85 - 95 µ



40 - 60 µ

30 - 90 µ

25 - 60 µ

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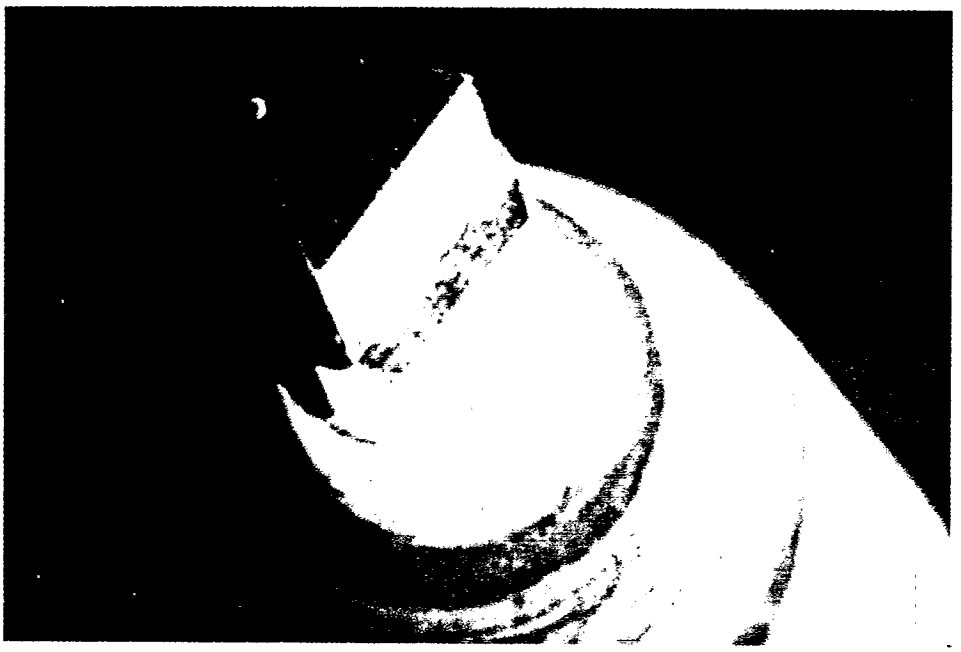
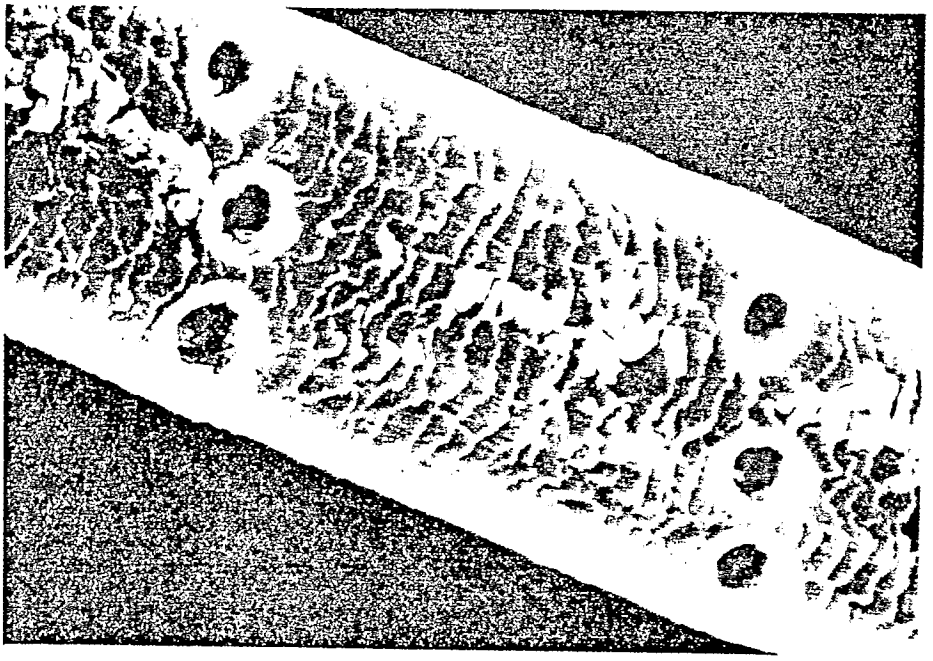
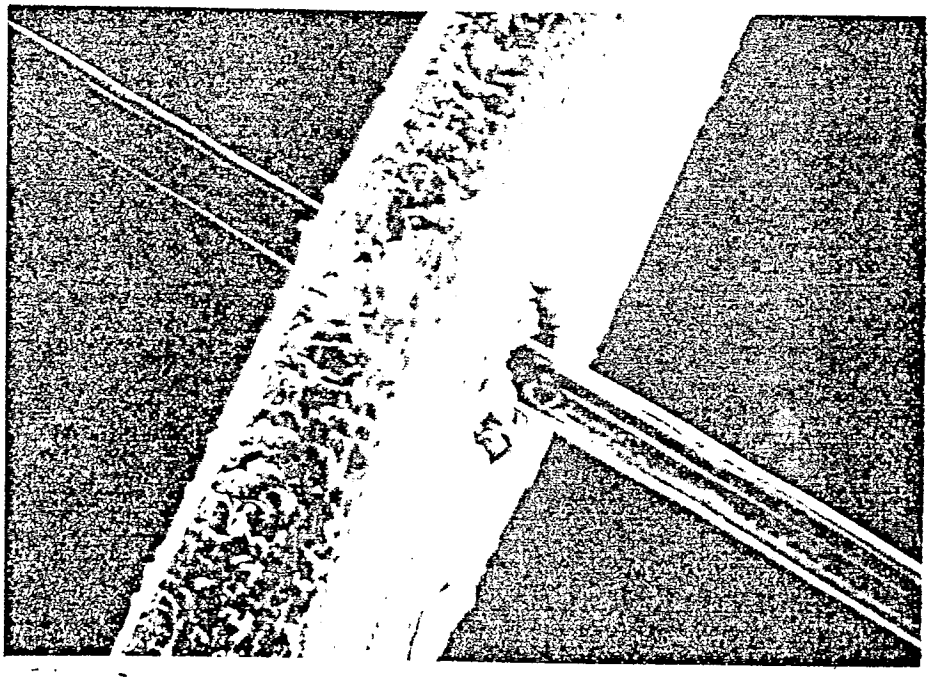
SPINNERETTE FORMING TOOL

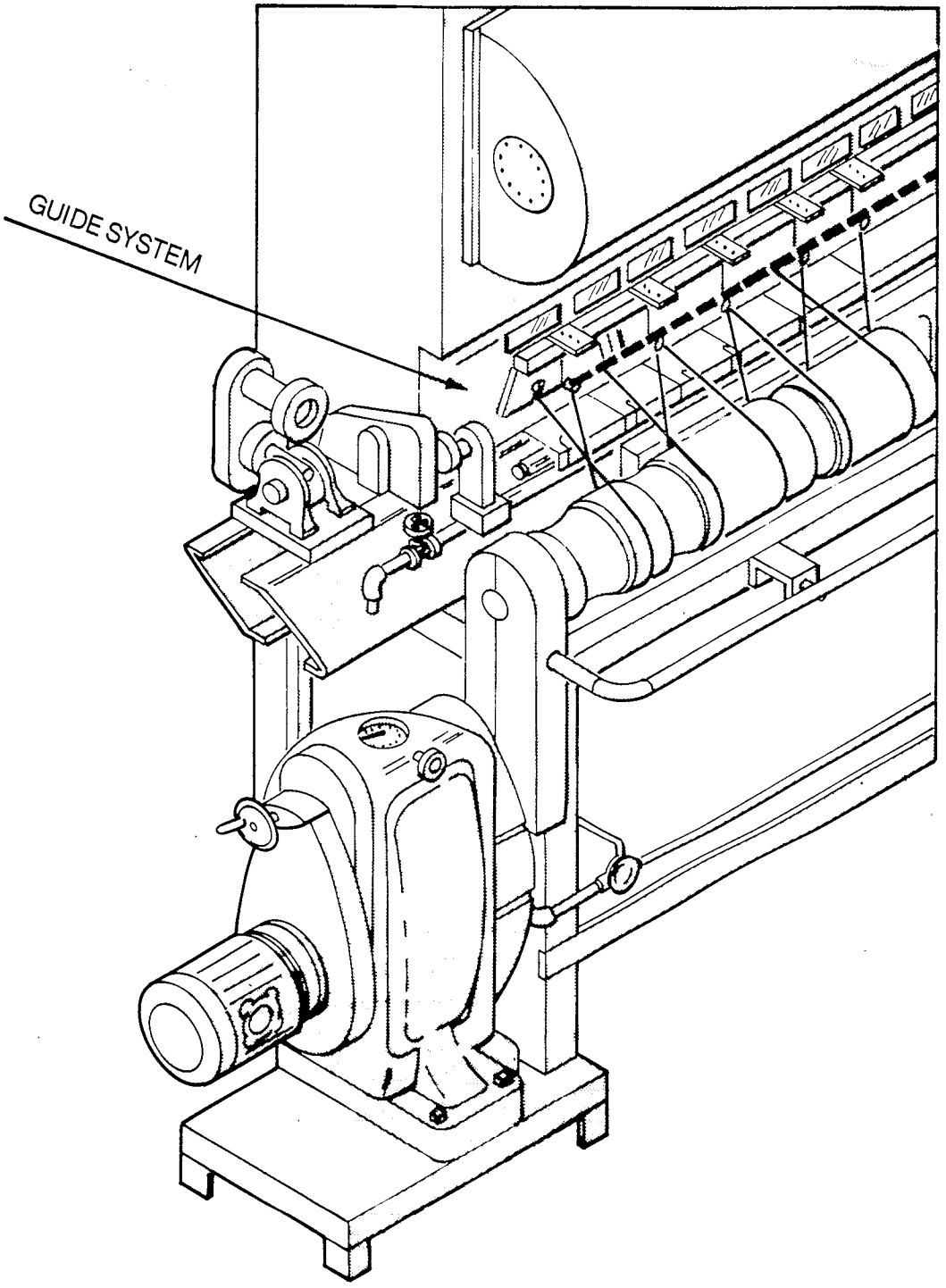


HUMAN HAIR WITH DRILLED HOLES



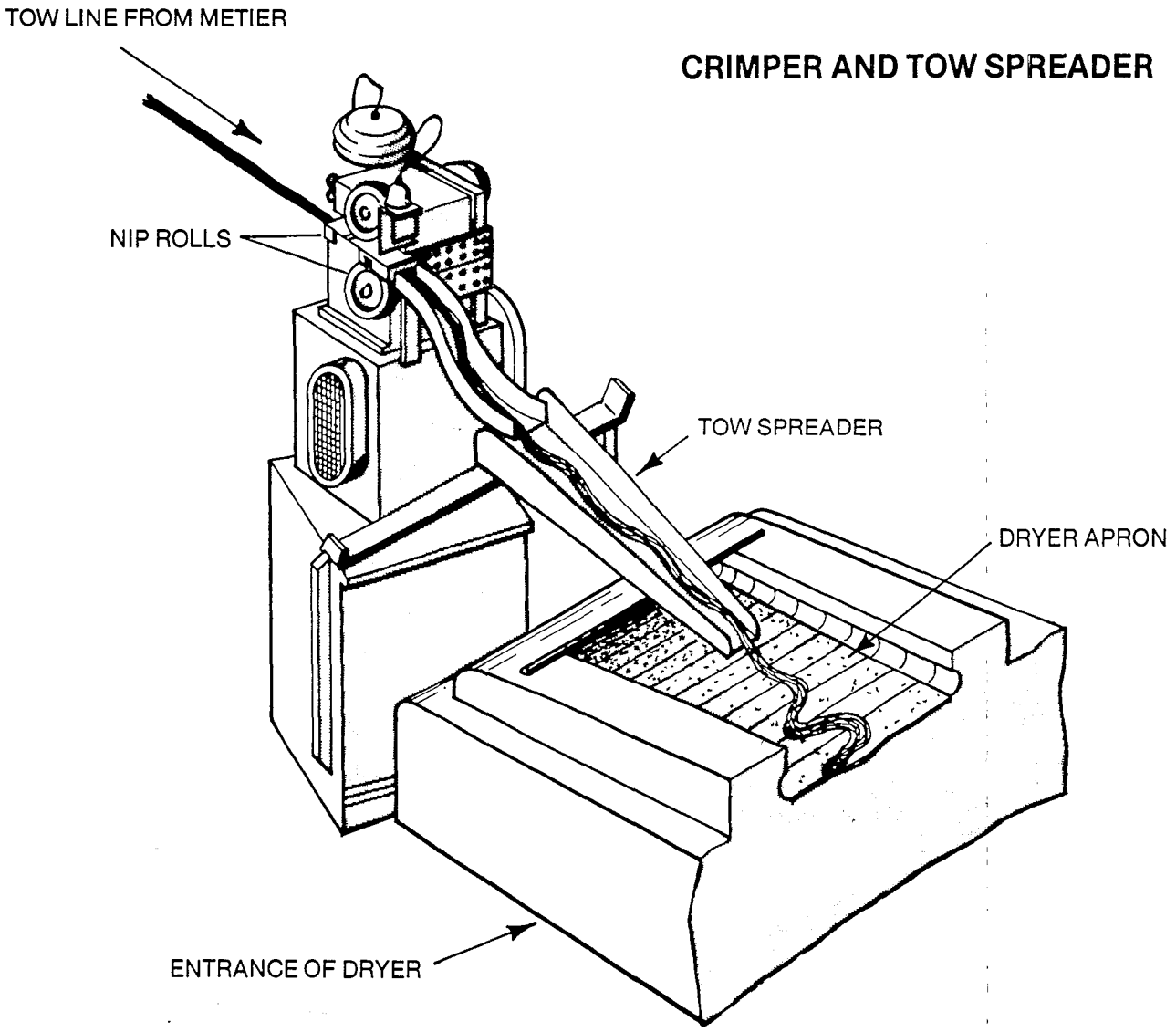
ACETATE FILAMENT PASSING THROUGH HAIR





FLOOR LEVEL PORTION OF TOW EXTRUSION MACHINE

CRIMPER AND TOW SPREADER



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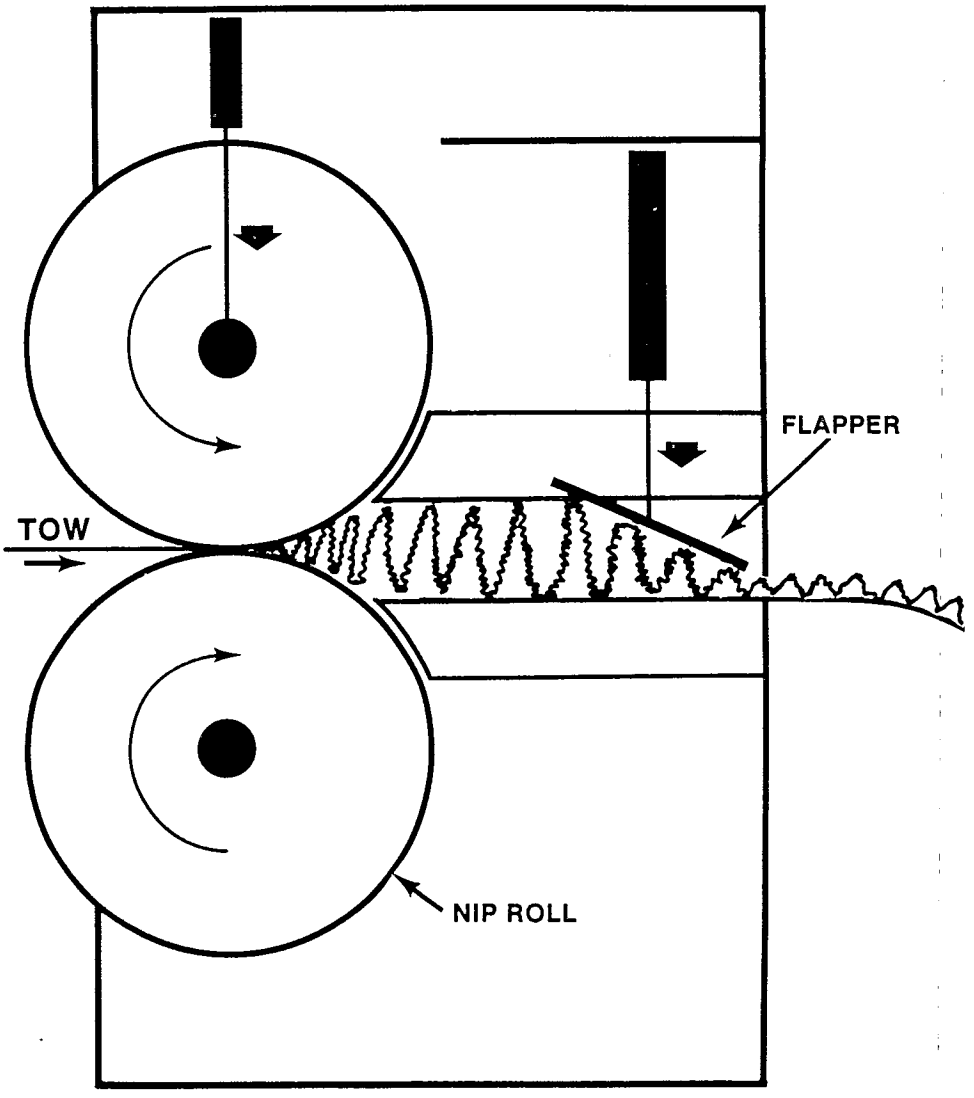
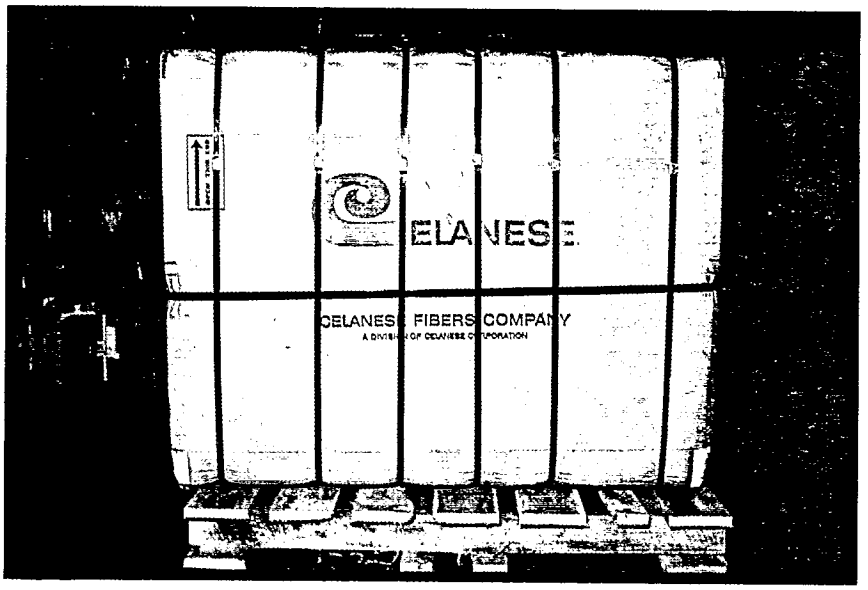
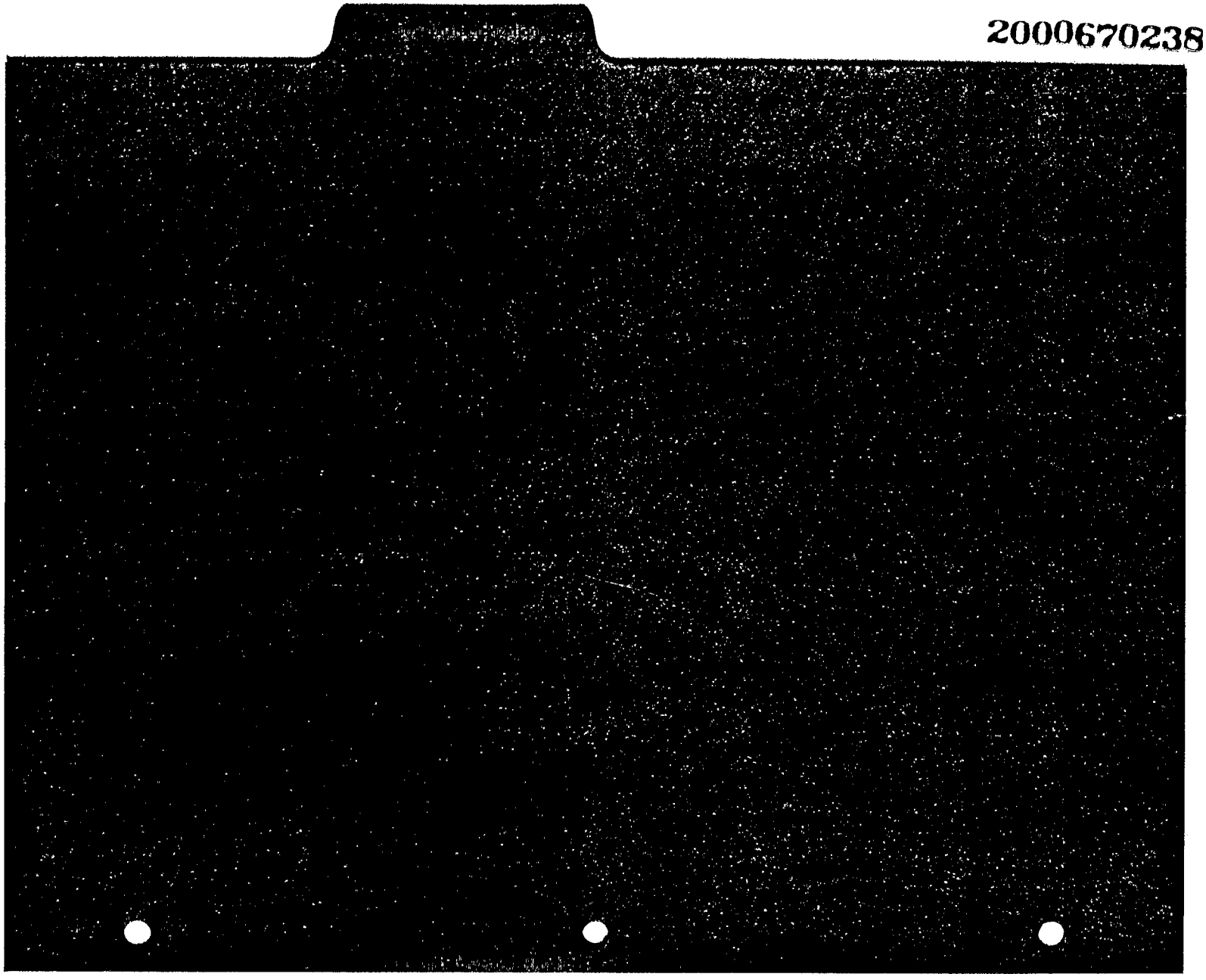
CRIMPING



BALE OF ACETATE TOW
READY FOR SHIPMENT





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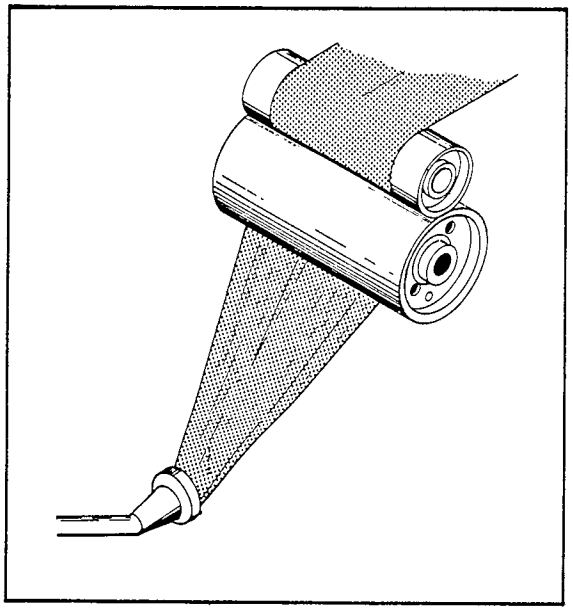
TOW CHARACTERIZATION

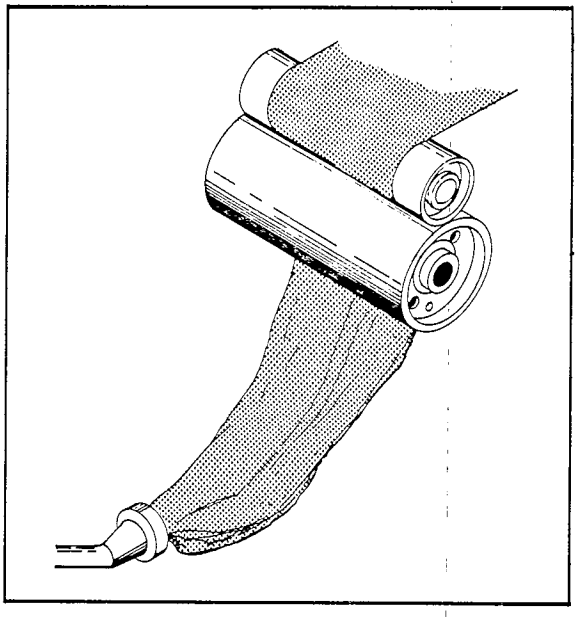
Tow characterization is the process of determining the lowest and highest attainable filter-rod weights and filter-rod pressure drop values for a cigarette tow item.

TENSION ON TOW TO PRODUCE MINIMUM AND MAXIMUM ROD WEIGHTS

S - WRAP DELIVERY



MINIMUM WEIGHT



MAXIMUM WEIGHT

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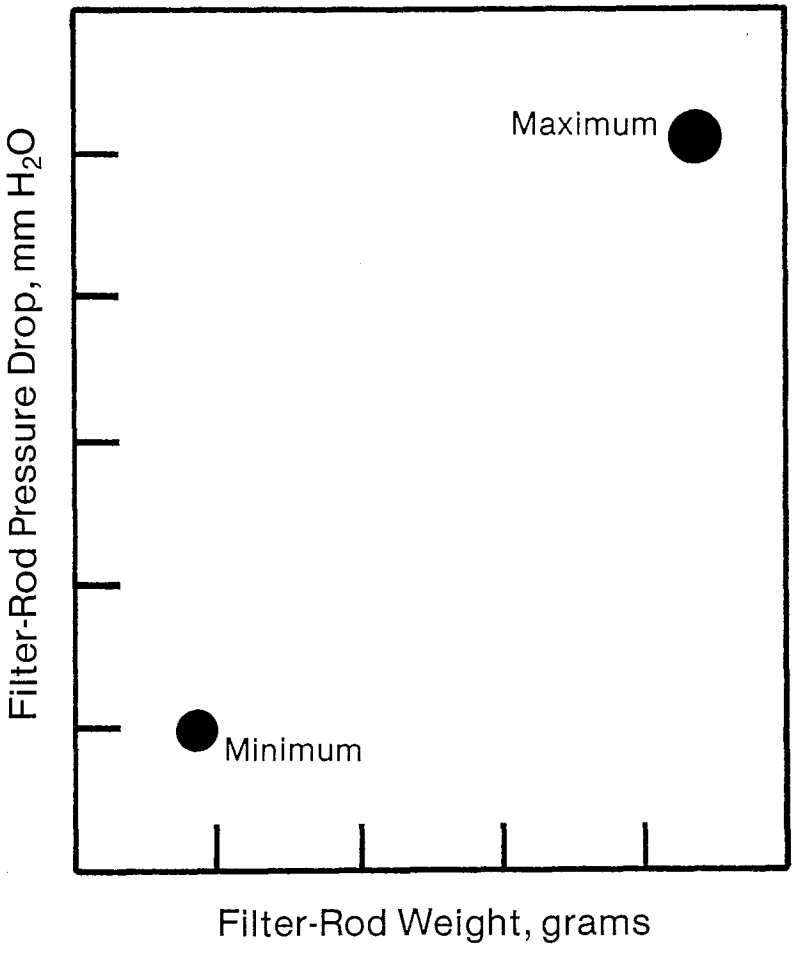
TYPICAL TOW CHARACTERIZATION GRAPH



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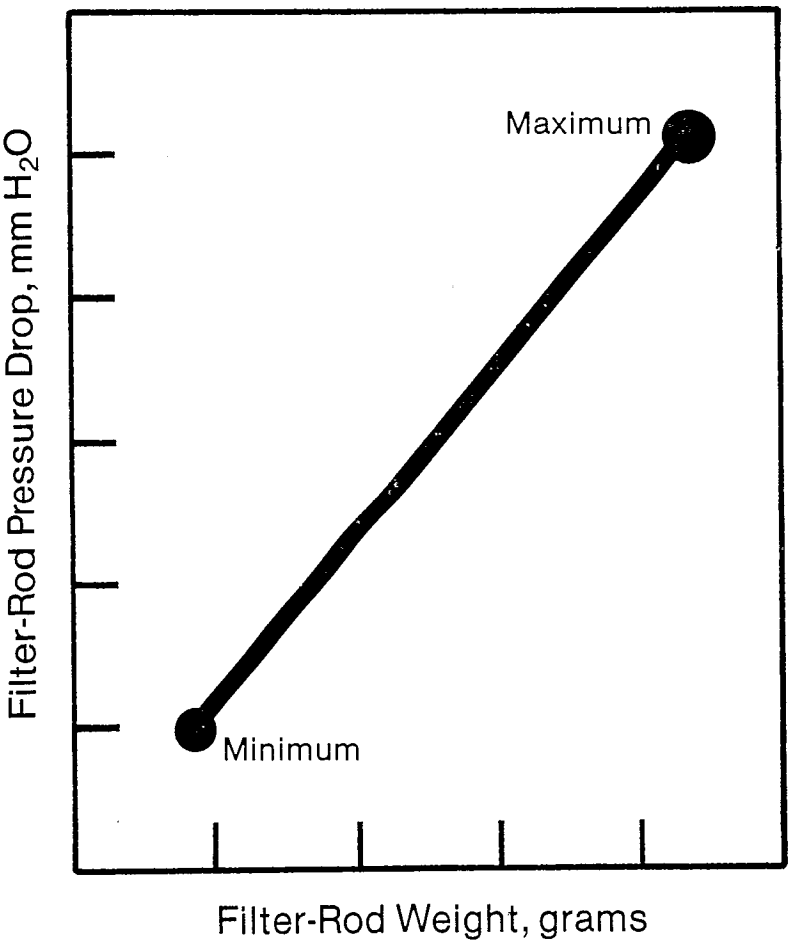
TYPICAL TOW CHARACTERIZATION GRAPH



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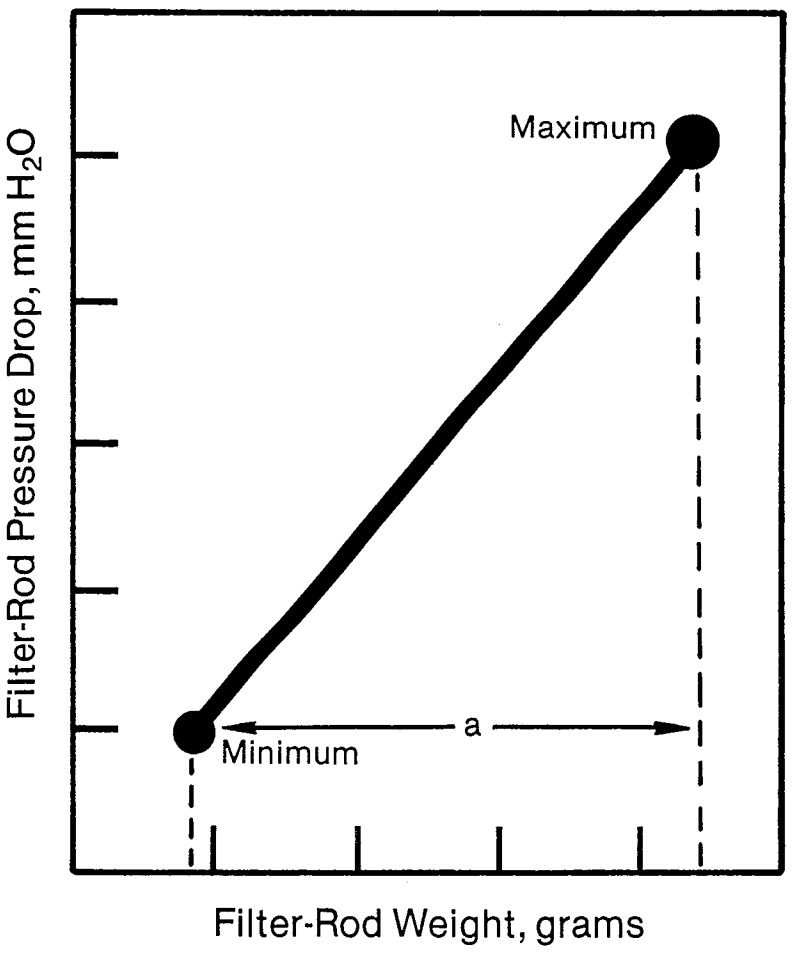
The position and length of this characterization line depend on the following factors:

- **Tow Item**
- **Filter Dimensions**
- **Opening Unit**
- **Manufacturing Speed**
- **Degree of Crimp Deregistration**

WEIGHT RANGE

The length of the tow yield line expressed in grams. It is the weight of the maximum weight minus the minimum weight.

WEIGHT RANGE



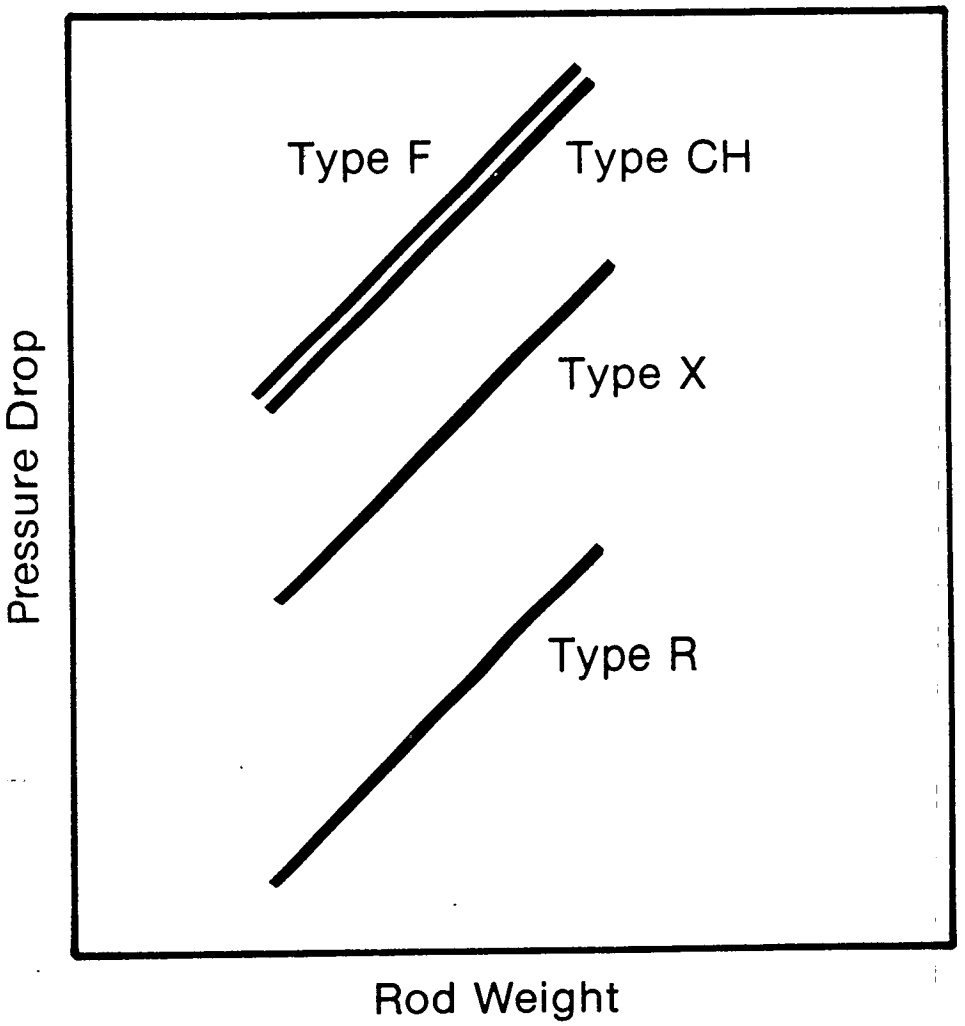
a = Weight range (grams)

TOW YIELD

Tow yield is the relationship between the weight of tow in a cigarette filter rod and the pressure drop across that rod:

$$\text{Tow Yield} = \frac{\text{Filter-Rod Pressure Drop}}{\text{Filter-Rod Weight}}$$

EFFECT OF CROSS SECTION ON YIELD AT CONSTANT dpf AND TOTAL DENIER



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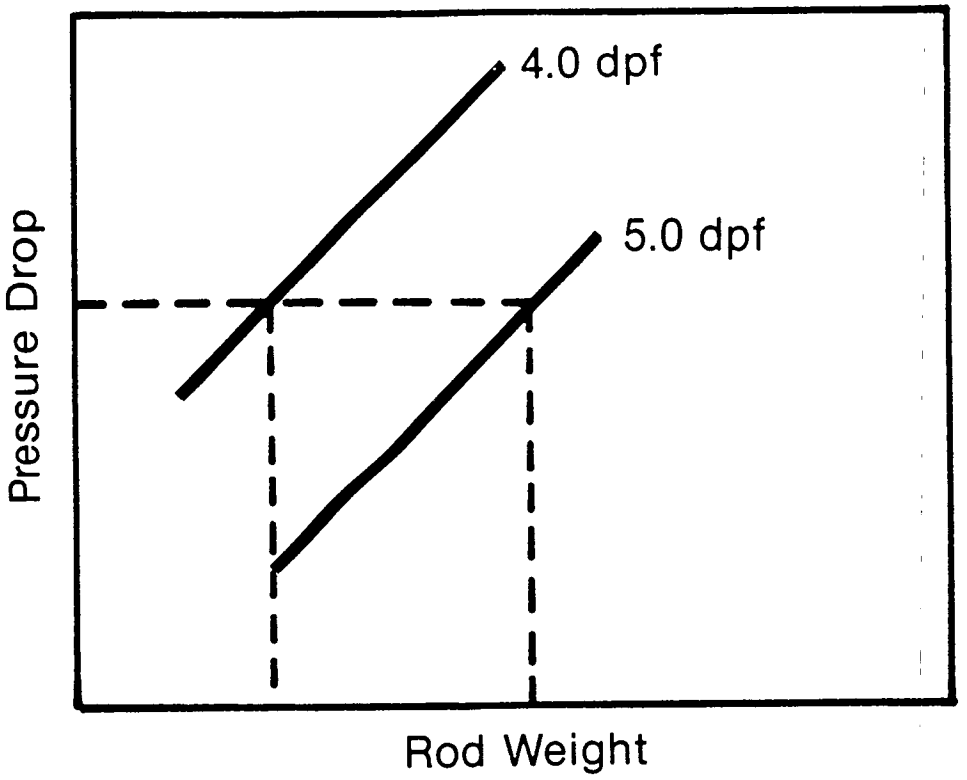
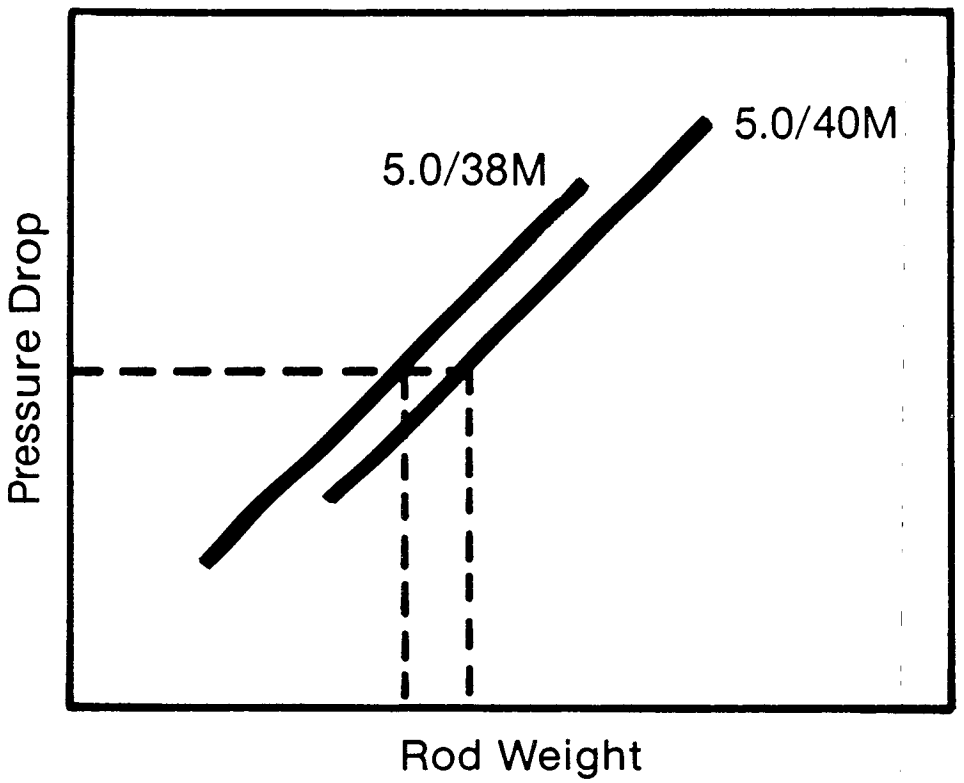
EFFECT OF dpf ON YIELD AT CONSTANT TOTAL DENIER AND CROSS SECTION



EFFECT OF TOTAL DENIER ON YIELD AT CONSTANT dpf AND CROSS SECTION



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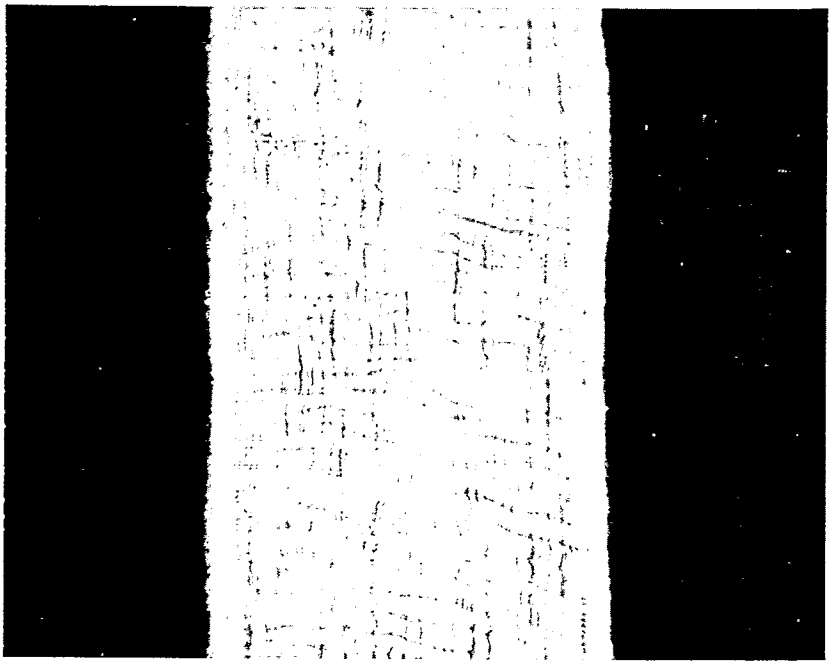
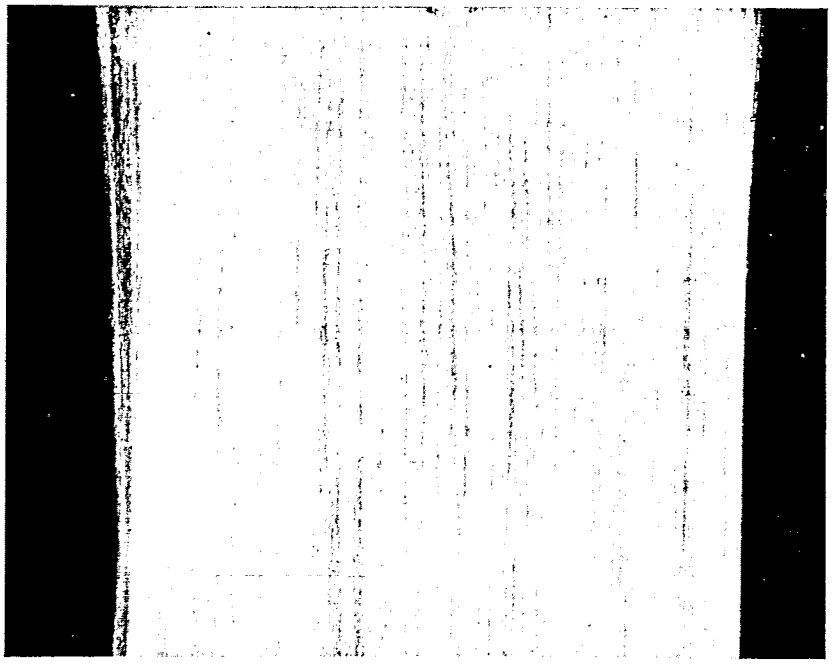
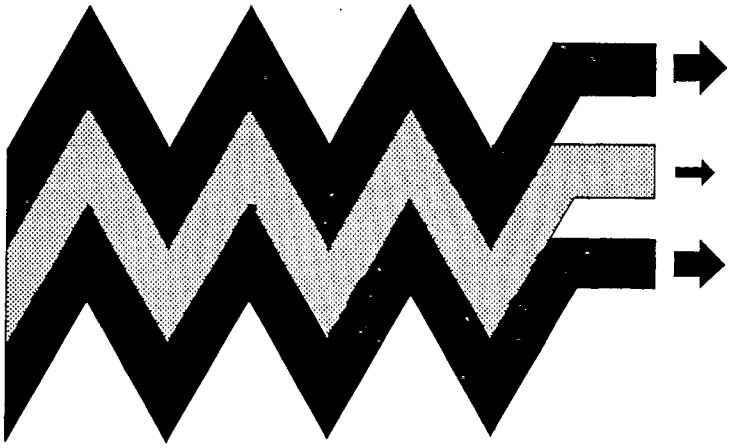
TOW AS SUPPLIED



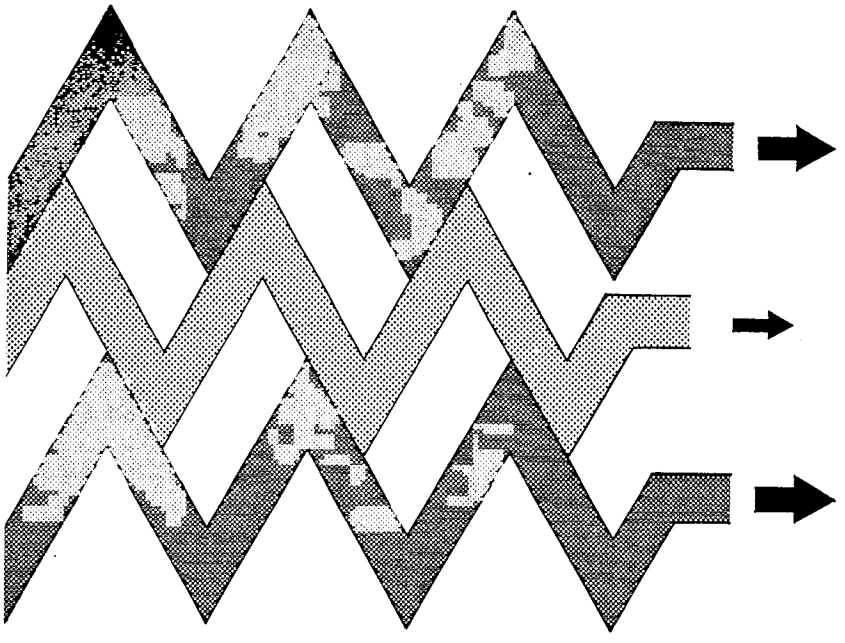
THREADED-ROLL OPENED TOW



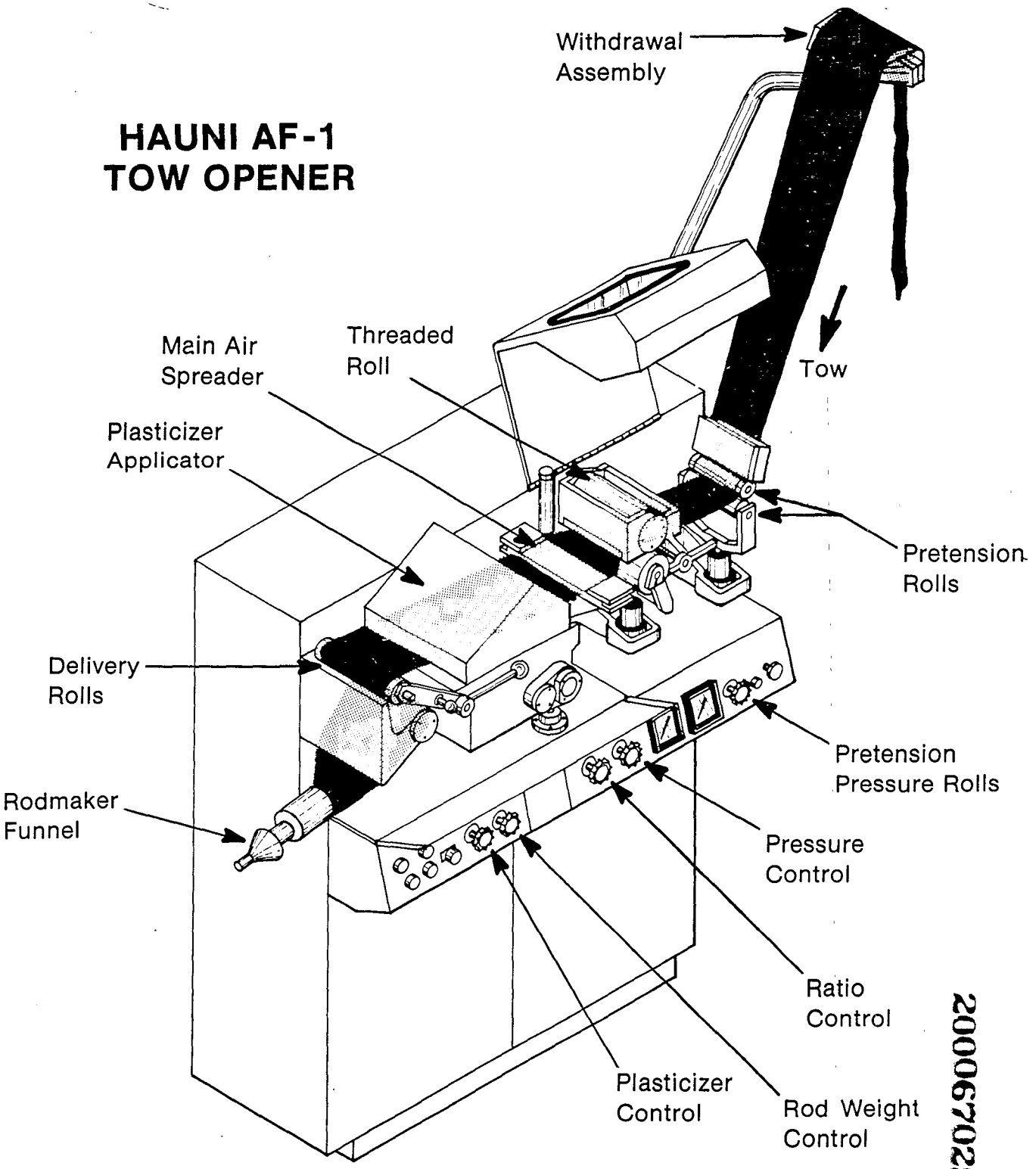
DIFFERENTIAL GRIP



DEREGISTRATION



HAUNI AF-1
TOW OPENER



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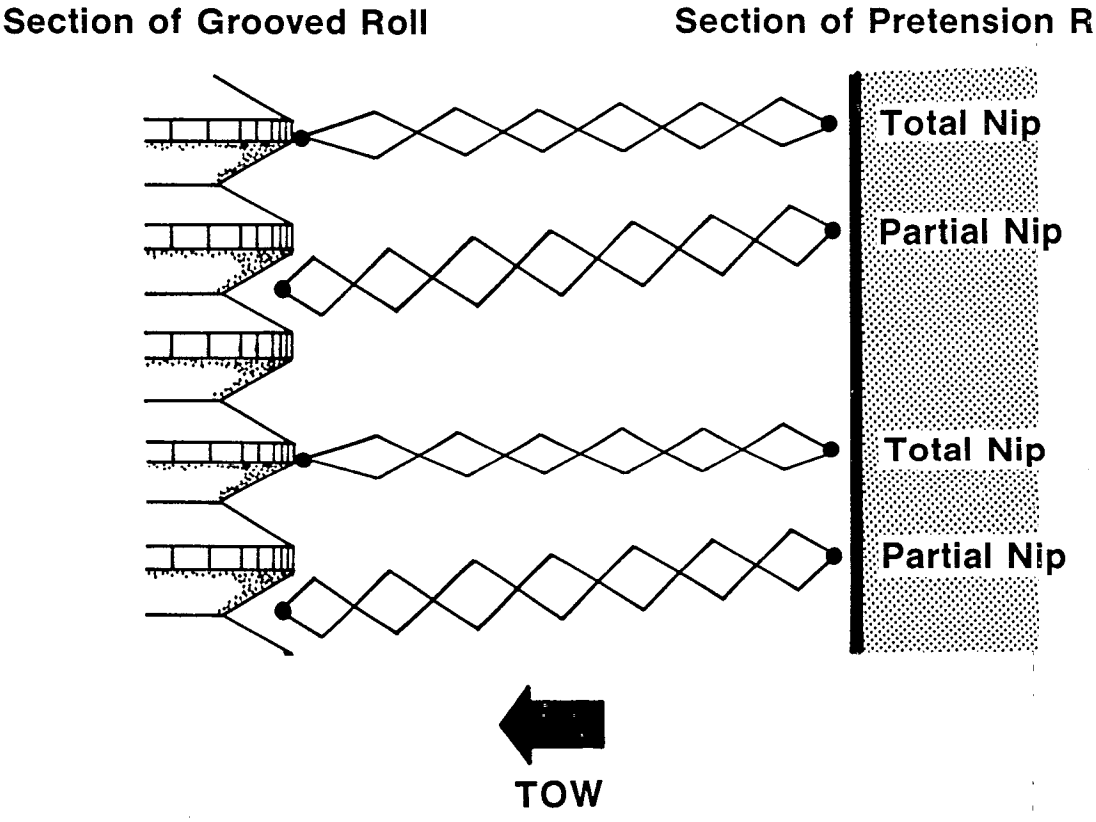
ACTION OF THREADED ROLLS ON CRIMPED FILAMENTS IN TOW BAND

(Hauni AF 1)



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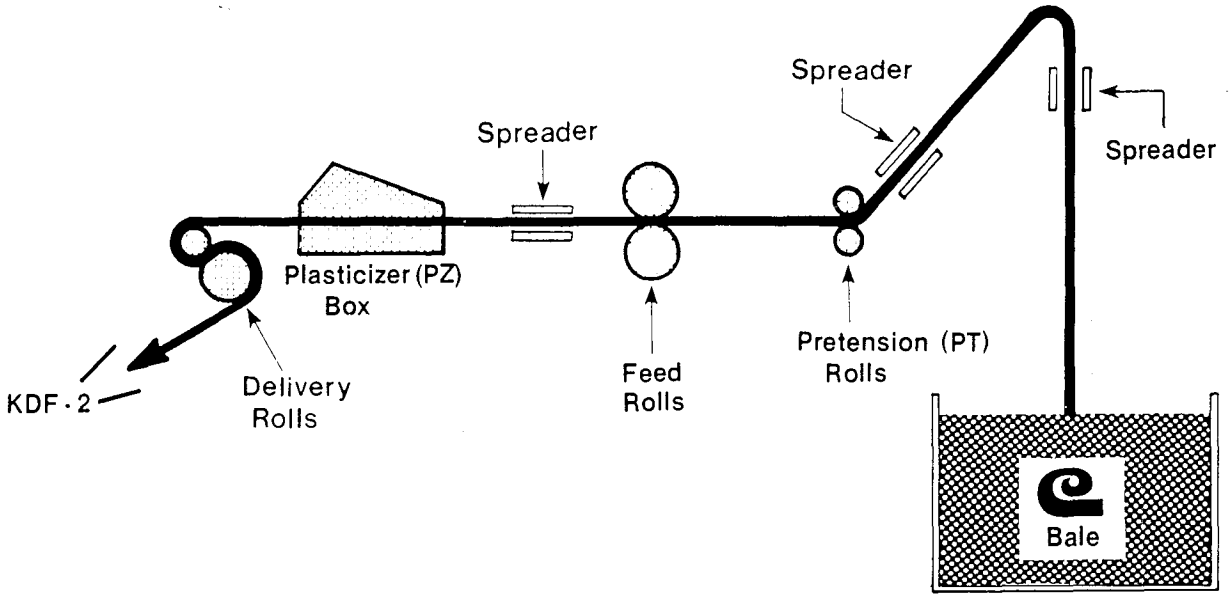
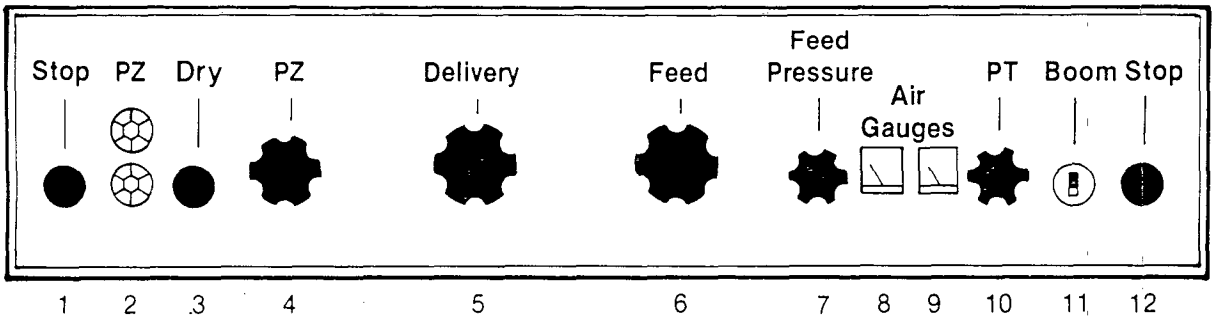
AF-1 OPERATION



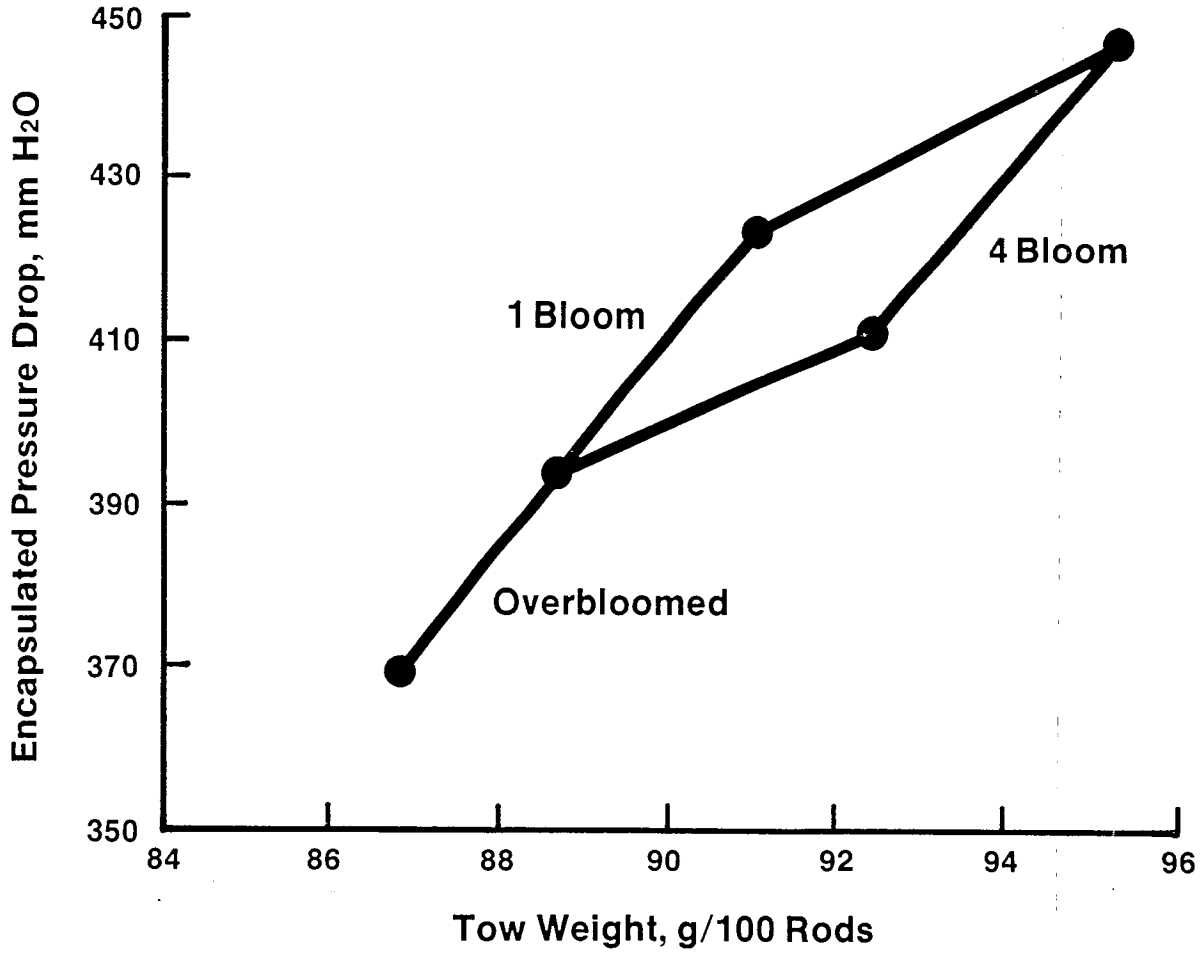
AF-1 CONTROL PANEL



1. Stop Button
2. Plasticizer tank level indicator lights
3. Push button for dry rods—stops PZ applicator
4. Plasticizer application level control
5. Delivery-roll PIV control—to adjust from min. to max. weight
6. Band width control—PIV control to adjust feed/delivery-roll ratio (usually 1.25 - 1.4:1)
7. Feed-roll pressure regulator
8. Gauge for feed-roll pressure—usually 2.5 - 3.0 bar
9. Gauge for Pretension-roll pressure—the most sensitive and important control on machine. Used to adjust opening—usually 0.8 - 1.6 bar
10. Pretension-roll pressure regulator
11. Switch to lower or raise boom for thread up
12. Stop switch

EFFECT OF PRETENSION ON BLOOM

Rod 126 × 24.7 mm, Tow Item 3.4CH/46 Lot 299
Hauni AF 1



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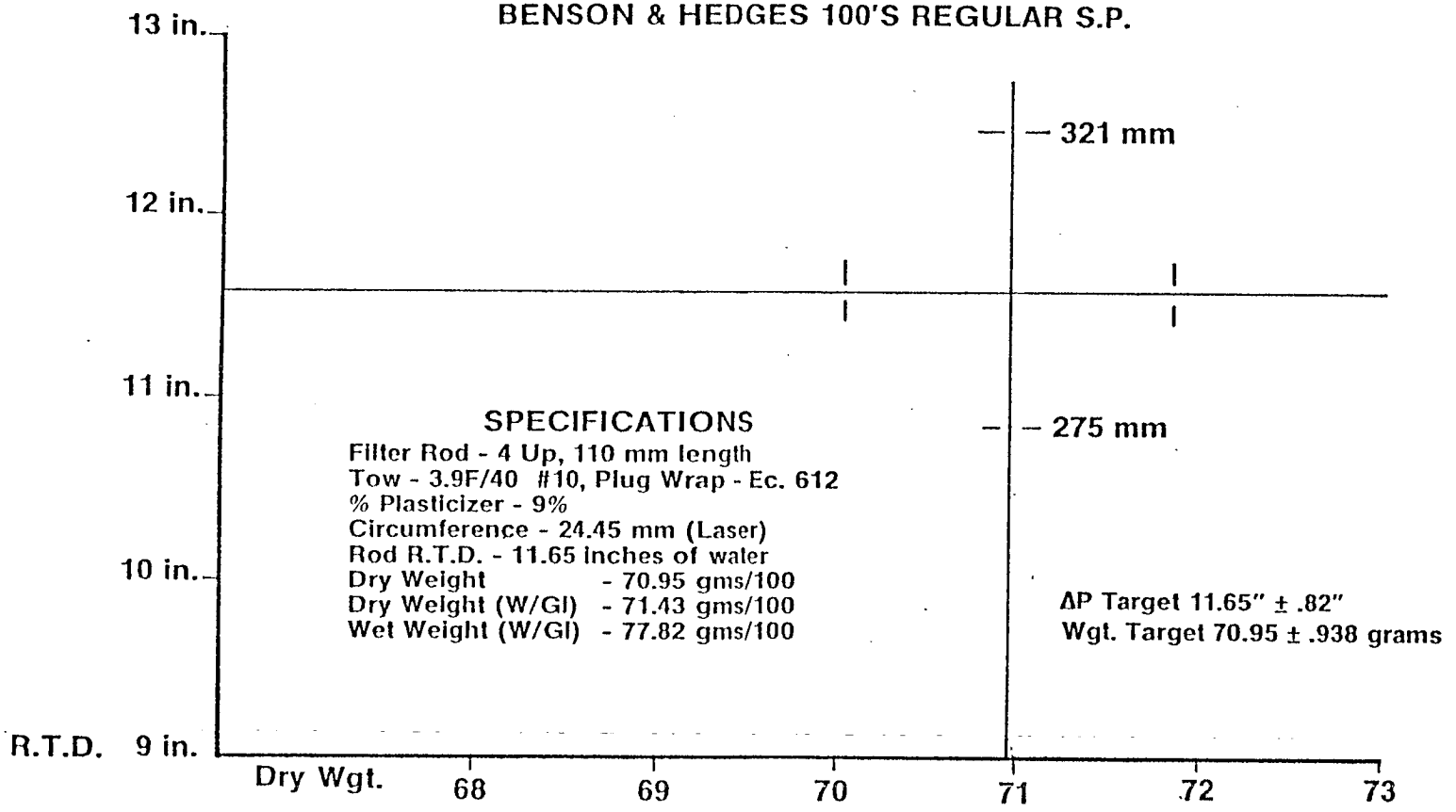

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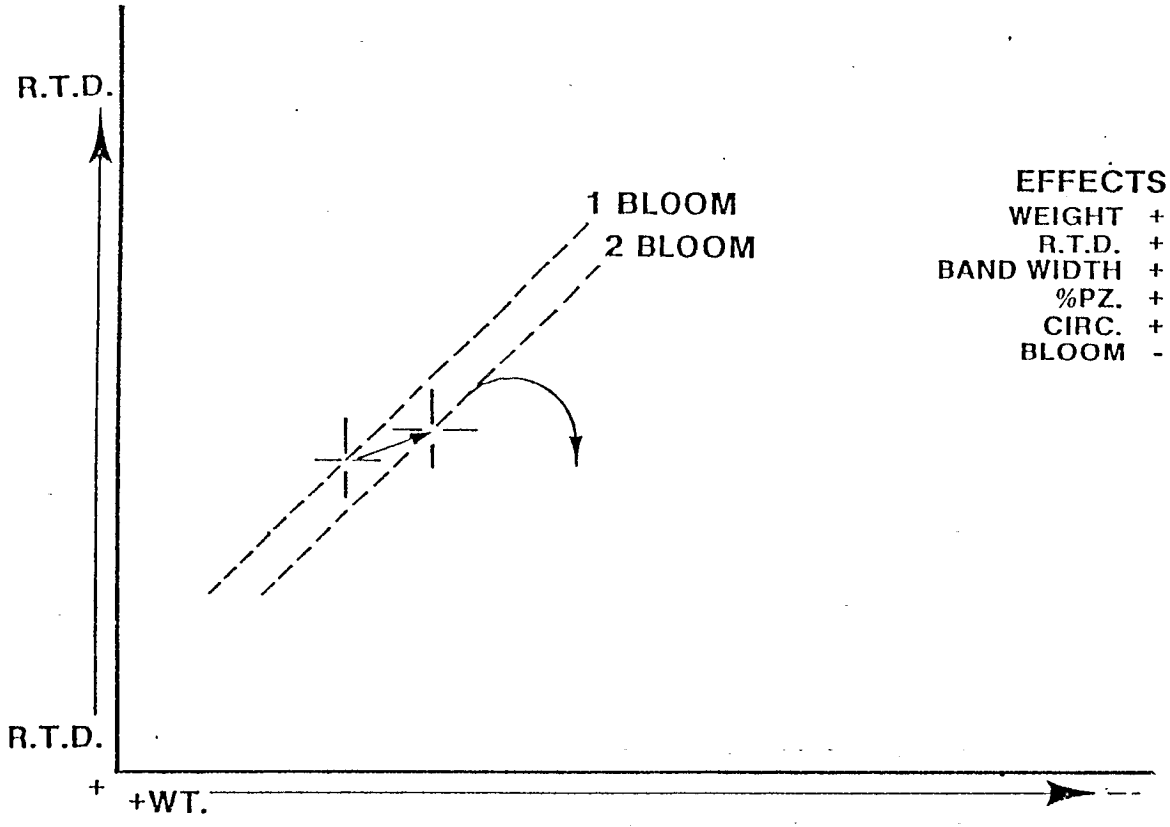
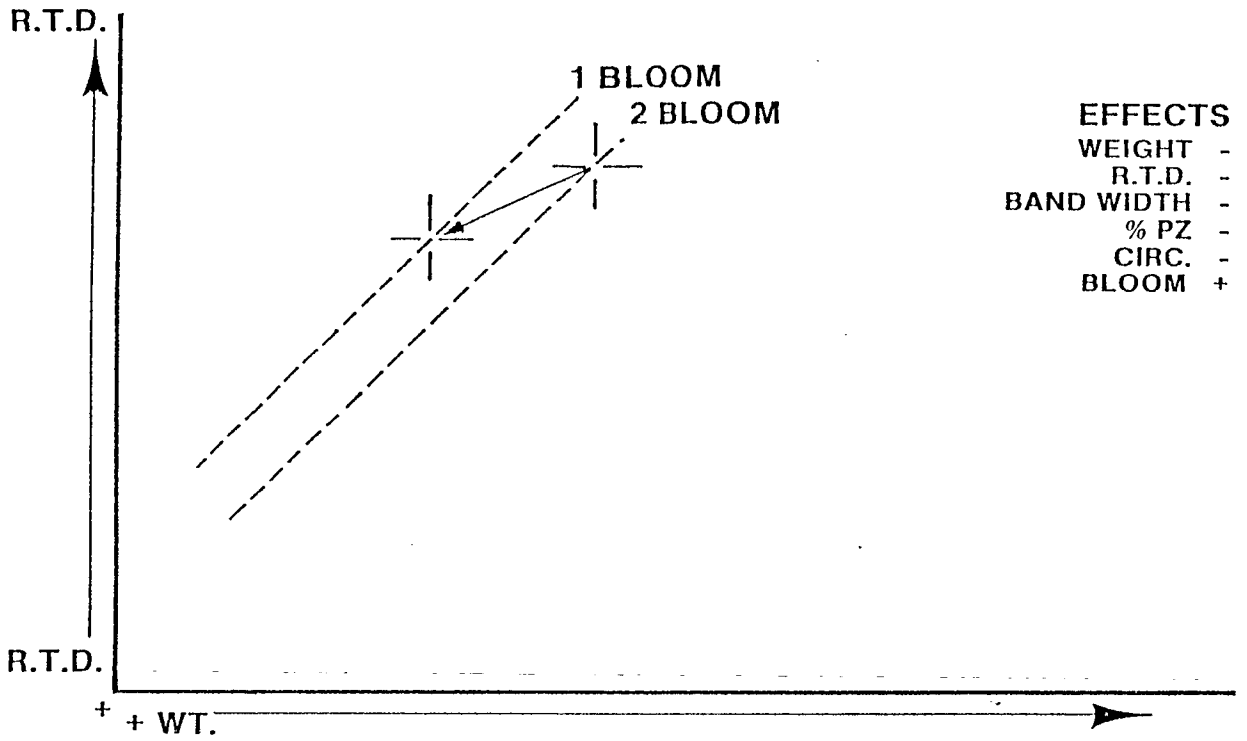
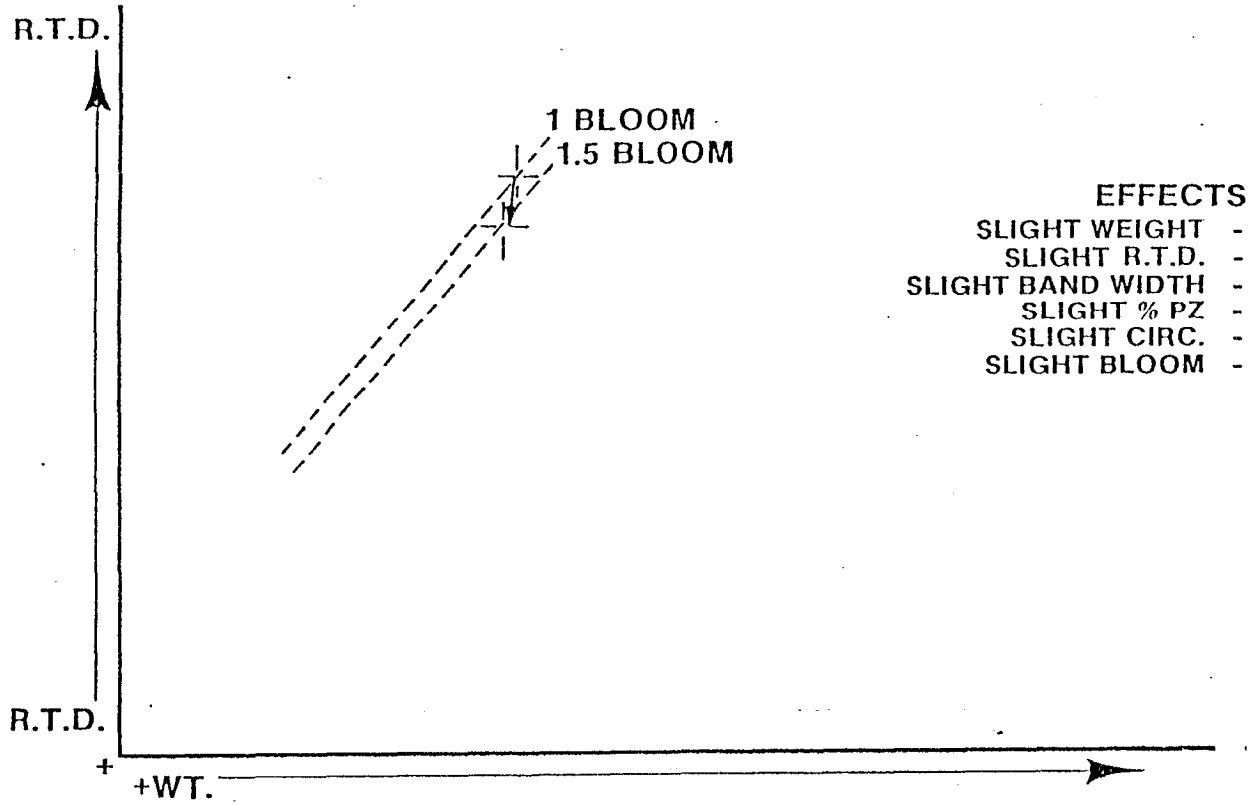
I. DECREASE PT. PRESSURE OR INCREASE SPEED OF PT. ROLL



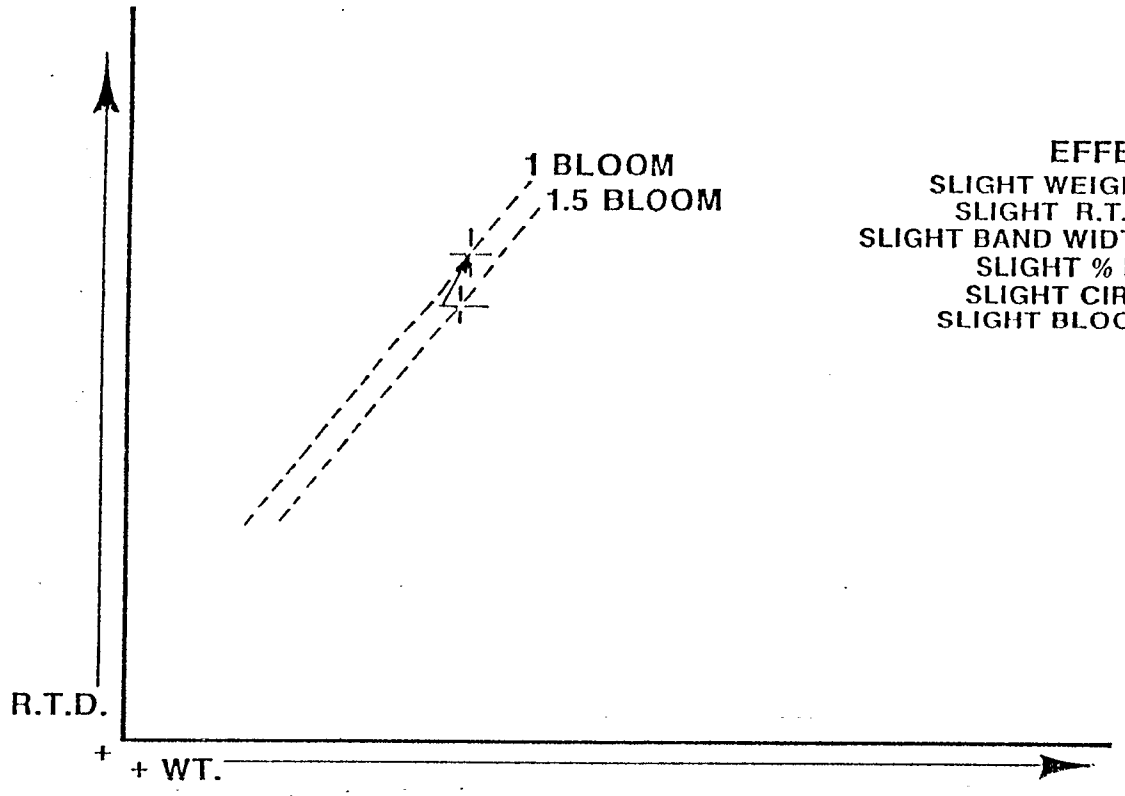
II. INCREASE PT. PRESSURE OR DECREASE SPEED OF PT. ROLL



III. DECREASE RATIO ROLL SPEED



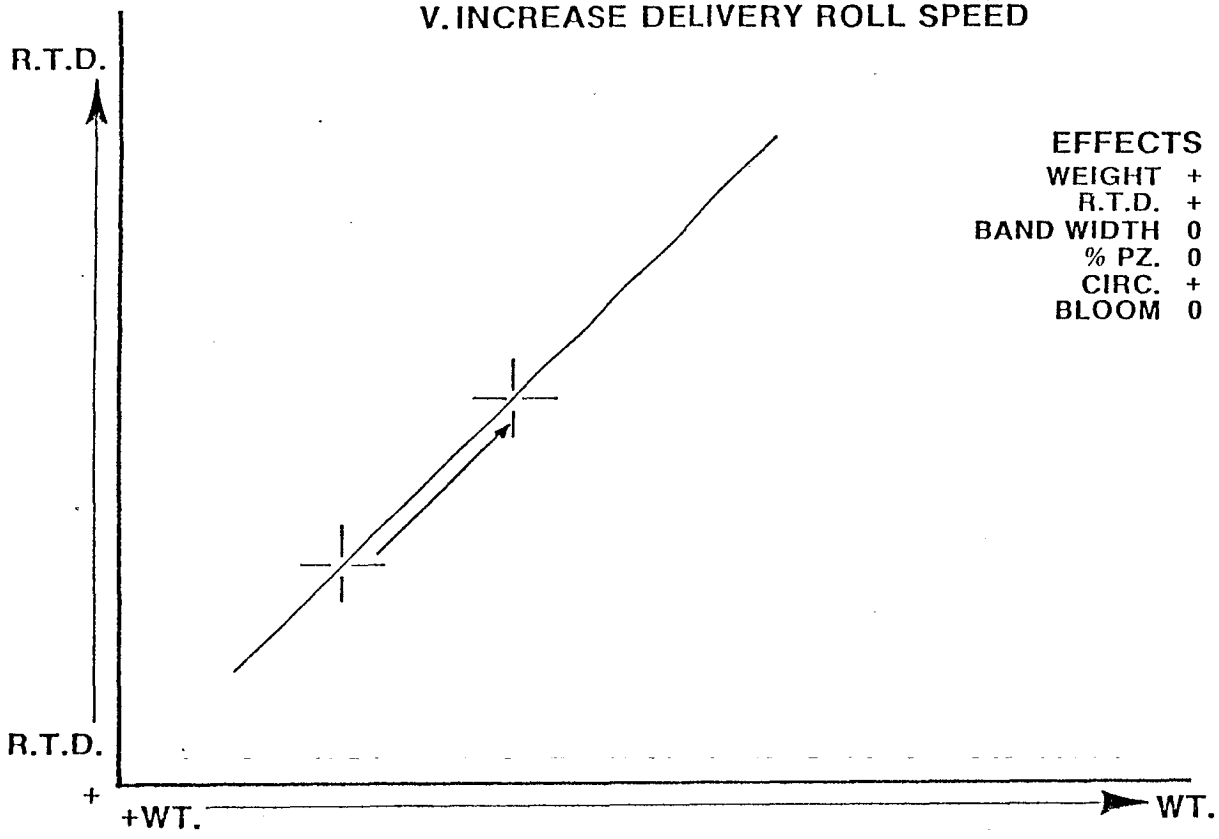
IV. INCREASE RATIO ROLL SPEED



EFFECTS

SLIGHT WEIGHT	+
SLIGHT R.T.D.	+
SLIGHT BAND WIDTH	+
SLIGHT % PZ	+
SLIGHT CIRC.	+
SLIGHT BLOOM	+

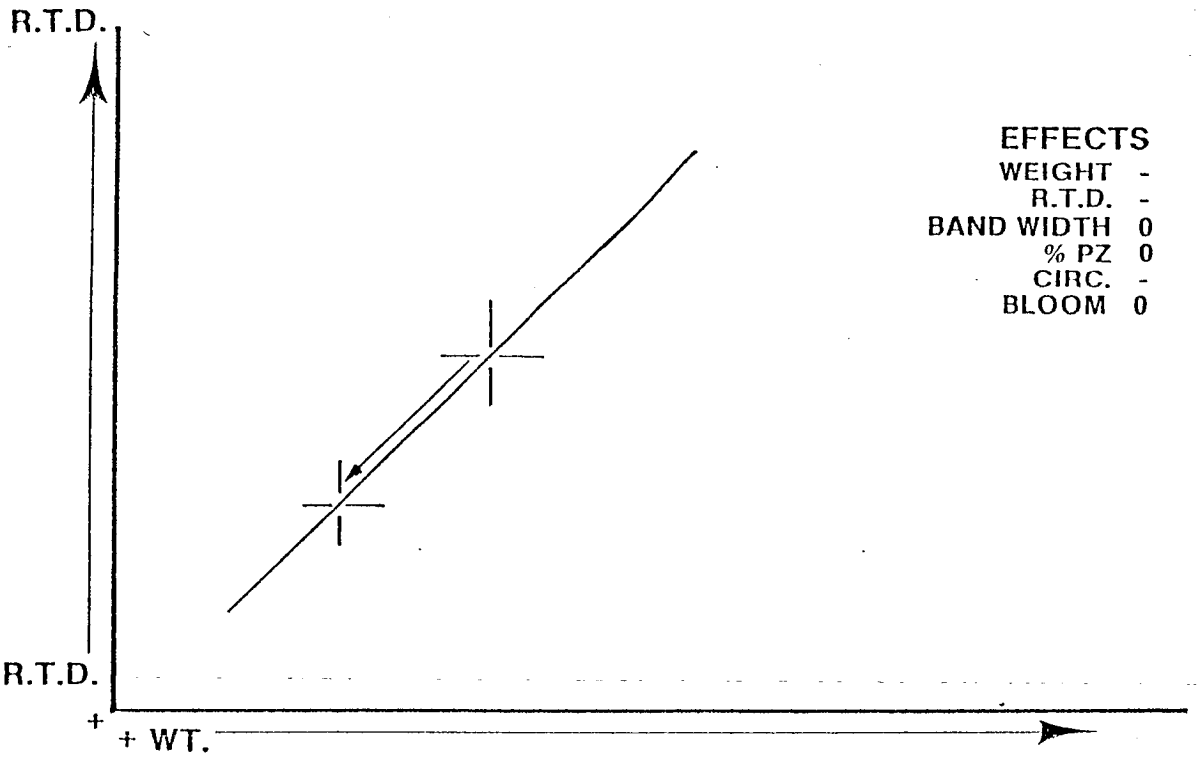
V. INCREASE DELIVERY ROLL SPEED



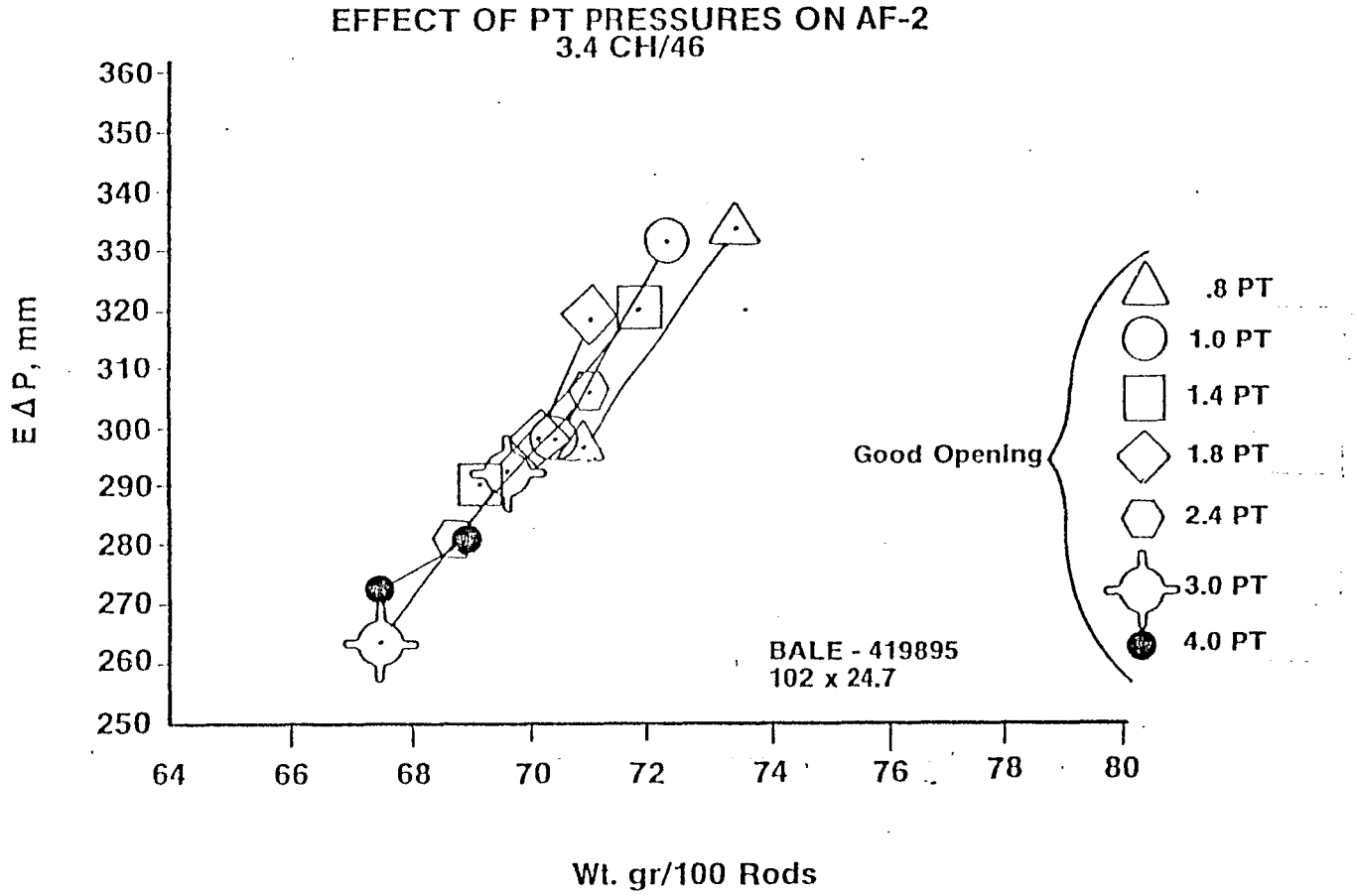
EFFECTS

WEIGHT	+
R.T.D.	+
BAND WIDTH	0
% PZ.	0
CIRC.	+
BLOOM	0

VI. DECREASE DELIVERY ROLL SPEED



EFFECTS	
WEIGHT	-
R.T.D.	-
BAND WIDTH	0
% PZ	0
CIRC.	-
BLOOM	0



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WHICH FIRST ADJUSTMENT WOULD BE APPROPRIATE TO OBTAIN TARGET? WRITE IN 1 AND 2 IF MORE THAN ONE ADJUSTMENT IS NECESSARY.

TARGET Weight: 71.43 gms./100 Rods
TARGET R.T.D.: 11.65 inches of water
TARGET Circ.: 24.45 mm. (LASER)

1. EXAMPLE

WEIGHT	R.T.D.	CIRC.	BLOOM
69.5	10.7	24.45	Good

(a) Decrease P.T. Roll Pressure
(b) Increase Feed Roll Speed
(c) Increase Delivery Roll Speed
(d) Increase P.T. Roll Pressure

2.

WEIGHT	R.T.D.	CIRC.	BLOOM
72.5	12.4	24.45	Under

(a) Decrease P.T. Roll Pressure
(b) Decrease Delivery Roll Speed
(c) Increase P.T. Roll Pressure
(d) Increase Delivery Roll Speed

3.

WEIGHT	R.T.D.	CIRC.	BLOOM
72.5	10.2	24.45	Good

(a) Increase Delivery Roll Speed
(b) Decrease P.T. Roll Pressure
(c) Increase Ratio Roll Speed
(d) Increase Feed Roll Speed

4.

WEIGHT	R.T.D.	CIRC.	BLOOM
69.5	12.8	24.45	Good

(a) Decrease P.T. Roll Pressure
(b) Decrease Delivery Roll Speed
(c) Decrease Feed Roll Speed
(d) Increase Feed Roll Speed

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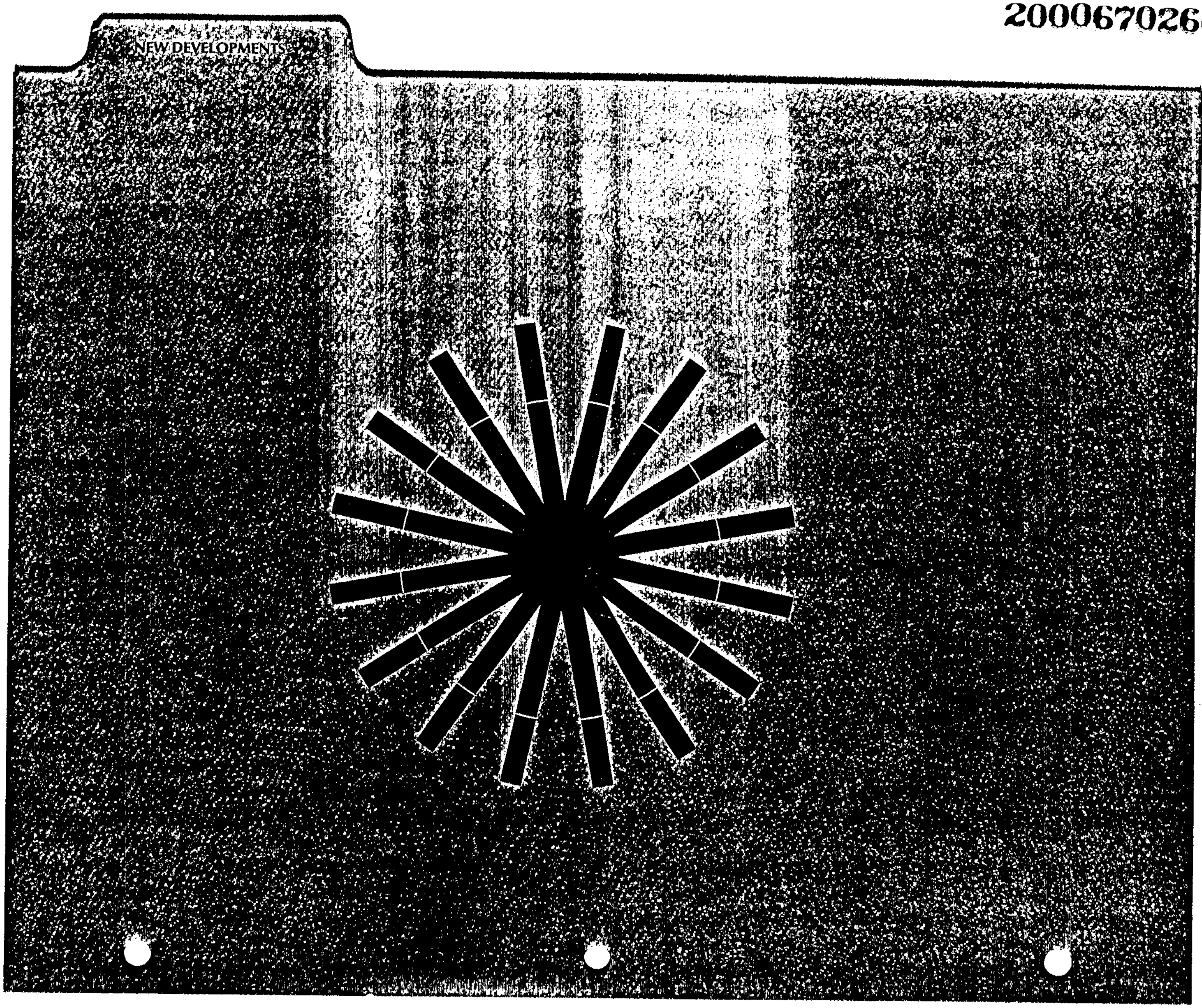


NON-WRAPPED ACETATE

August 4, 1981

Process Description

Background

Process Development

Economics

Status

PROCESS DESCRIPTION

STEAM INJECTION INTO GARNITURE

RAPID CURE OF ACETATE/PLASTICIZER

BACKGROUND

FILTRONA LTD DEVELOPMENT

SOLD FINISHED RODS

LICENSES AVAILABLE IN 1978

PHILIP MORRIS/CELANESE MUTUAL
DEVELOPMENT FROM 1979

PROCESS DEVELOPMENT NEAR COMPLETION

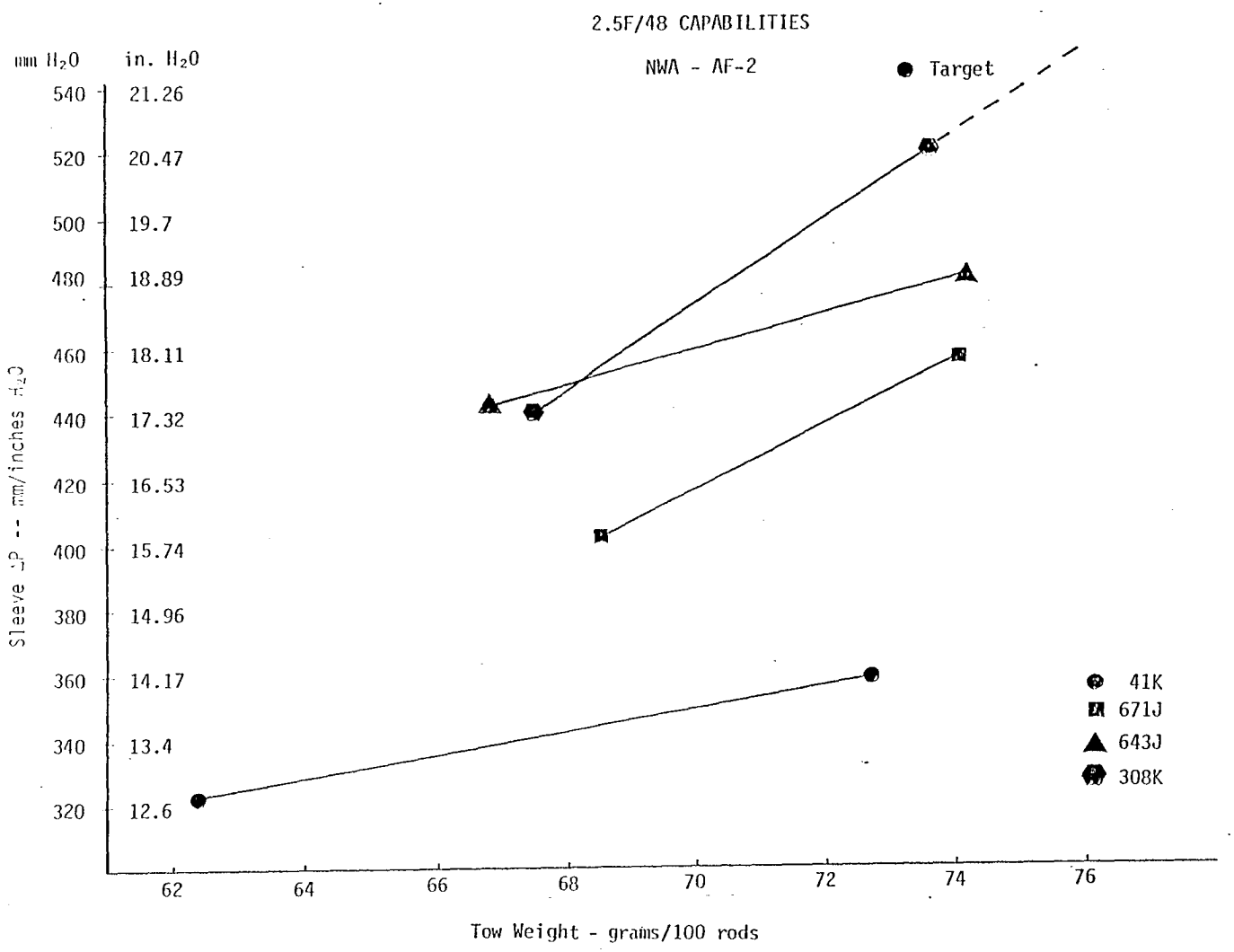
PROCESS DEVELOPMENT

YIELD LOSSES

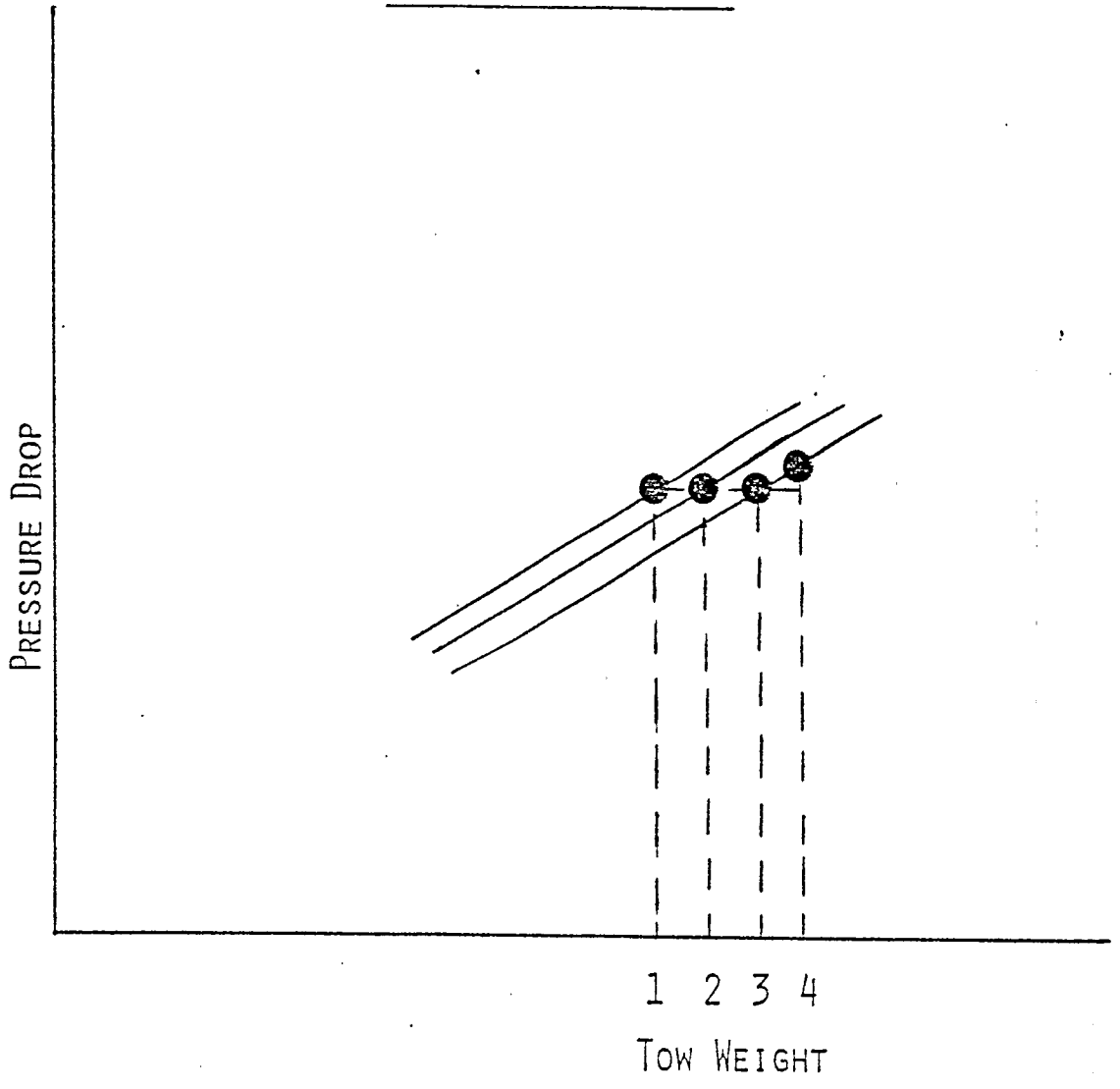
PRESSURE DROP MEASUREMENT

CIRCUMFERENCE MEASUREMENT

GARNITURE TAPE DEVELOPMENT



TOTAL YIELD LOSSES



1 CONVENTIONAL TARGET

2 STEAM LOSSES

3 DIMENSIONAL (TIPPING)

4 REMOVAL EFFICIENCY

$$\text{TOTAL} = \frac{4 - 1}{1} \times 100$$

2000702772

NWA ECONOMICS

Savings

Hot Melt

PVA

Paper

Additional Costs

License Fee

Capital Equipment

Yield Loss

Royalty

STATUS

PROCESS NOW COMMERCIAL

HIGH DPF - CO REDUCTION INVESTIGATIONS

ECONOMICS

CELANESE TECHNICAL SUPPORT AVAILABLE

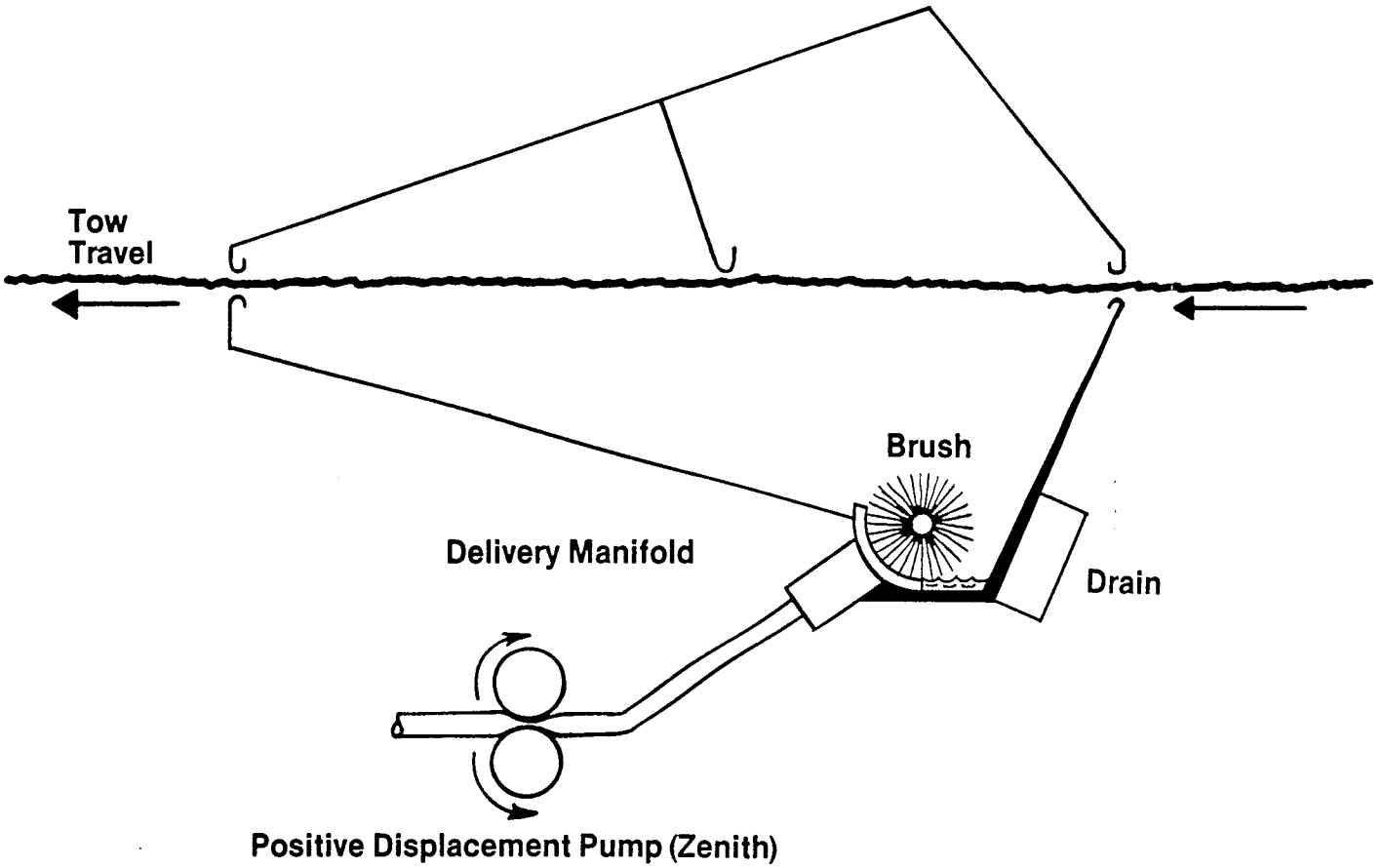
PLASTICIZER CONTROL SYSTEM

Concern has been growing in the cigarette industry about the control of plasticizer addition to acetate tow during filter rodmaking. Current production techniques tend to result in wide variations in plasticizer addition. Our studies show that about 60% of overall plasticizer variability is related to differences in operation among rodmakers and imprecise control of the rodmaking process over time. The wet/dry rod-weight test, commonly used to determine plasticizer add-on during production, produces waste and fails to provide continuous information about the plasticizing process. Further waste can result from dry-rod production that goes undetected until a routine check is made.

Previous systems to measure plasticizer addition did not control application but merely measured and displayed the plasticizer flow rate. Although several such monitors are commercially available, none has gained wide acceptance.

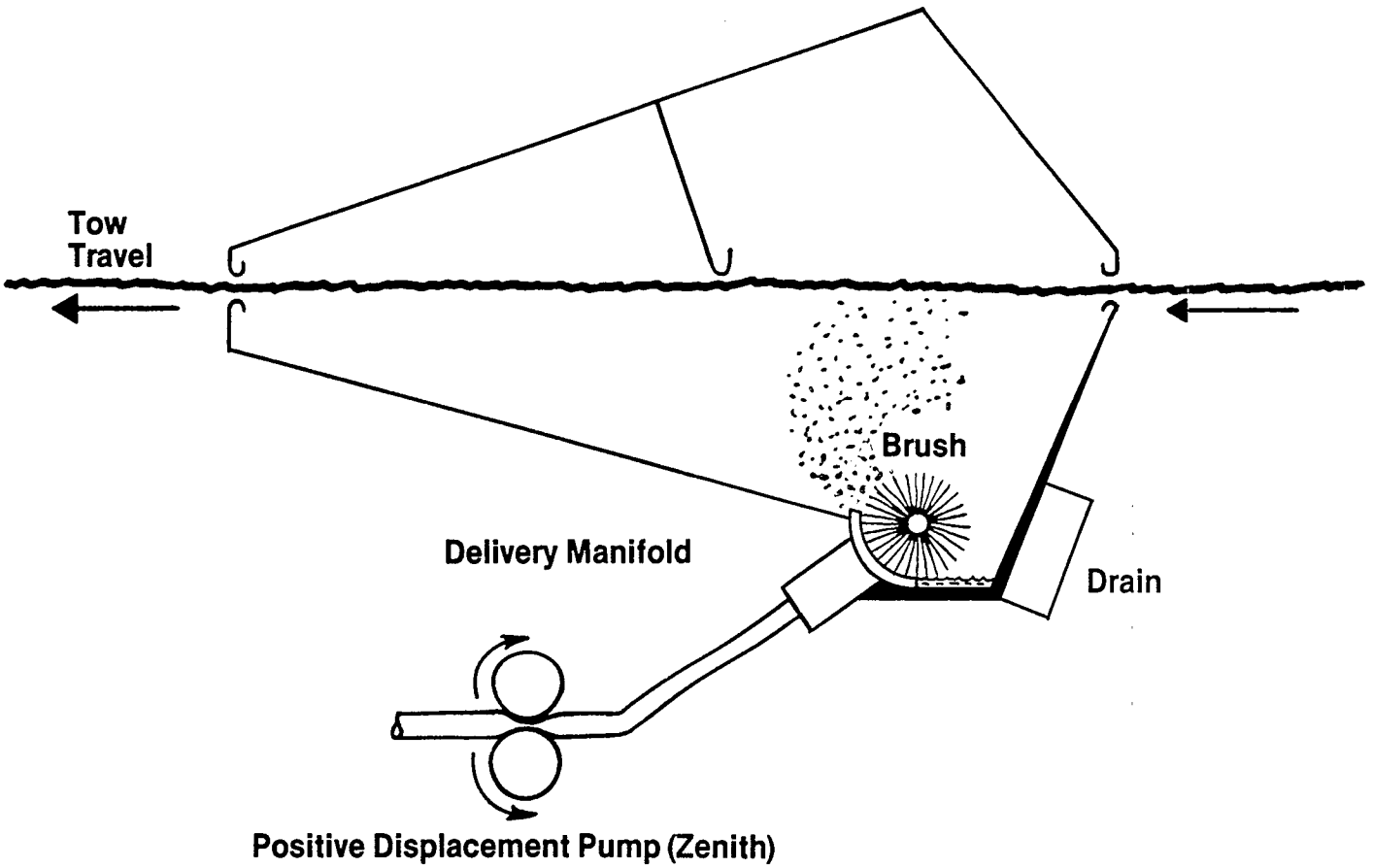
Celanese (USA) initiated and jointly developed with Hauni-Werke Körber & Co. KG a system that is designed to actually control rather than only monitor plasticizer addition during rodmaking. The system eliminates problems that arise from variable plasticizer application and improves the overall quality of the filter rods. In order that the cigarette industry may take full advantage of this new technology, Hauni-Werke Körber & Co. KG offers a plasticizer control system which can be retrofitted to existing AF-1 and AF-2 tow openers. The plasticizer control system is now standard equipment on new AF-2 units.

PLASTICIZER CONTROLLER



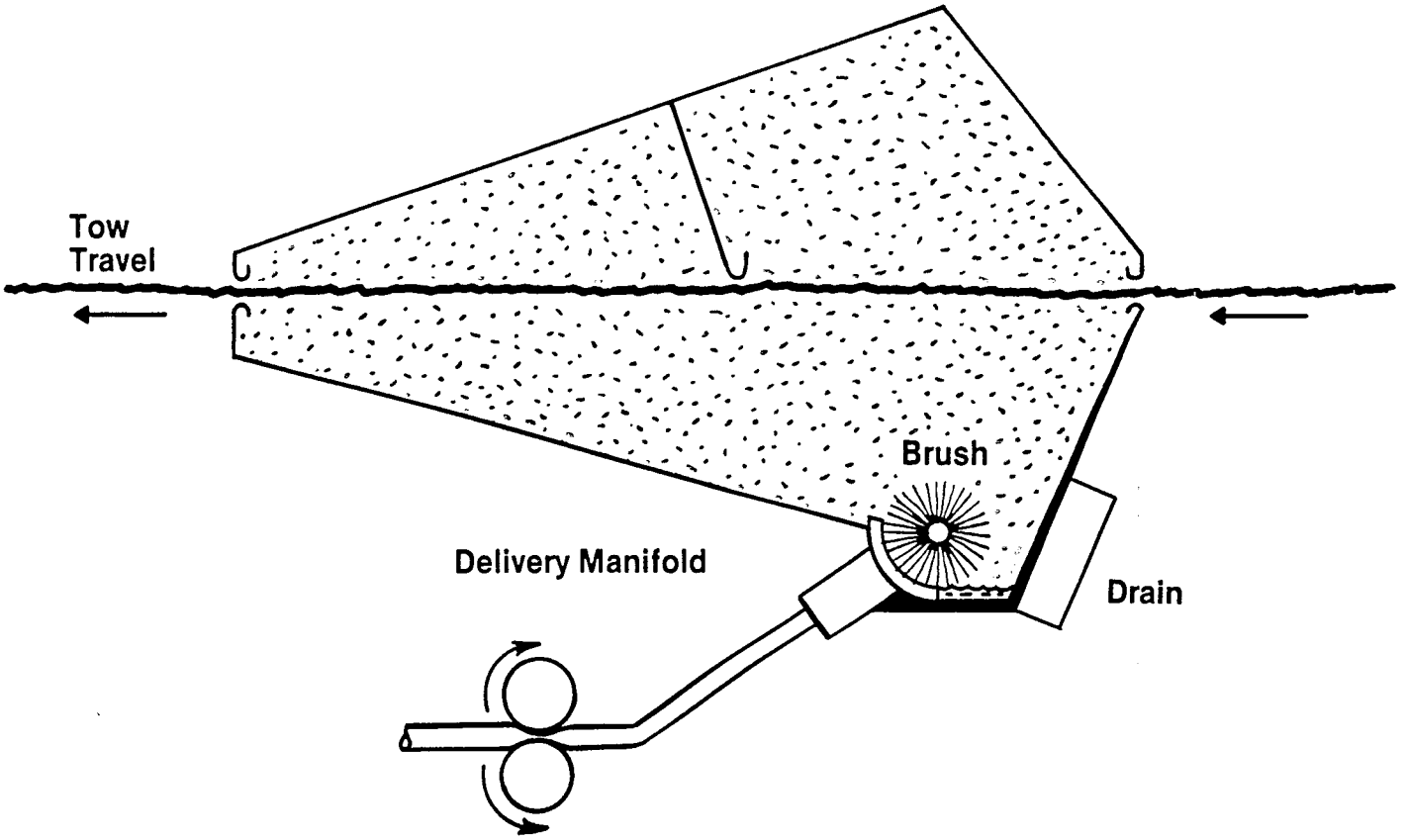
START: Positive displacement pump begins to supply plasticizer to the brush.

PLASTICIZER CONTROLLER



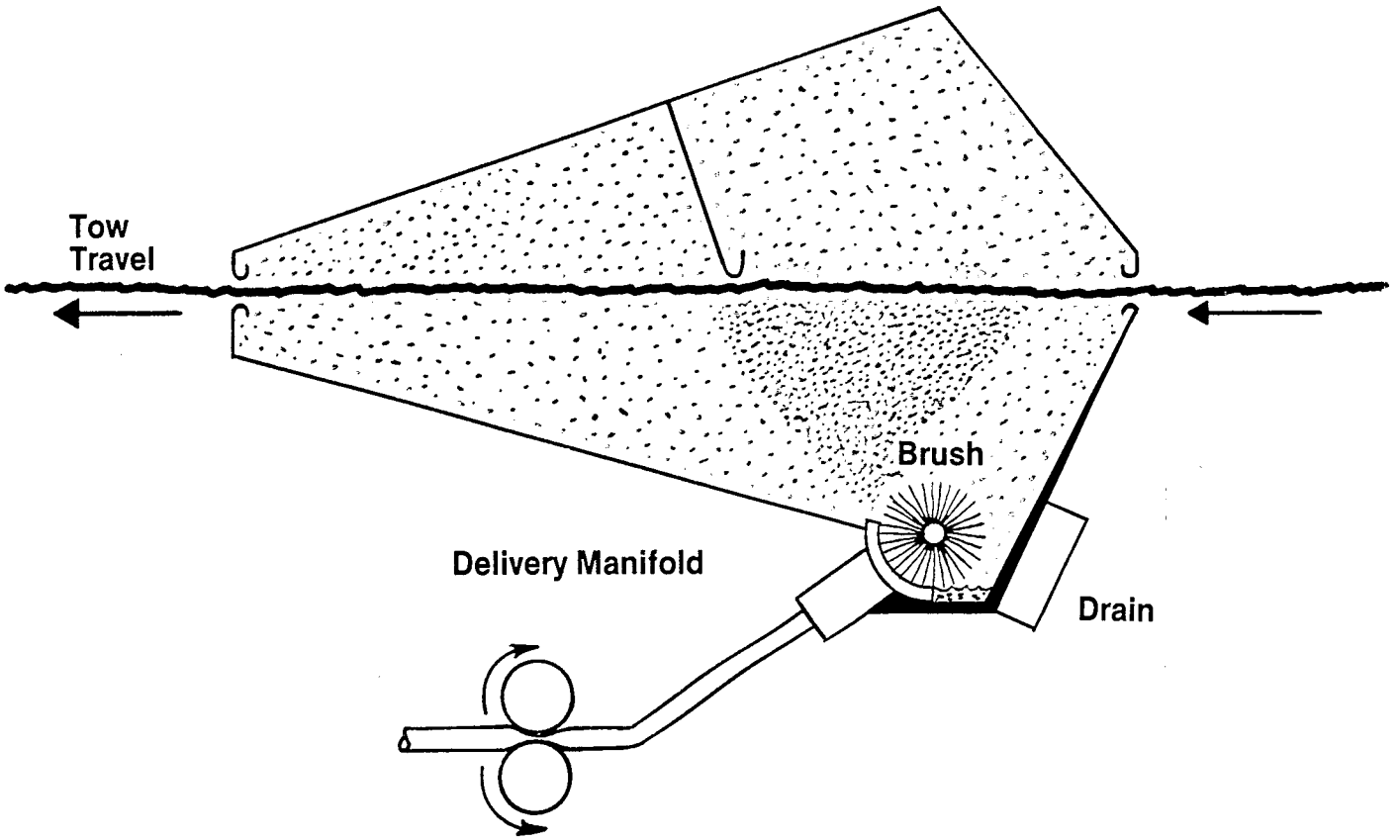
TRANSITION: Plasticizer droplets begin to spray up to the tow band.

PLASTICIZER CONTROLLER



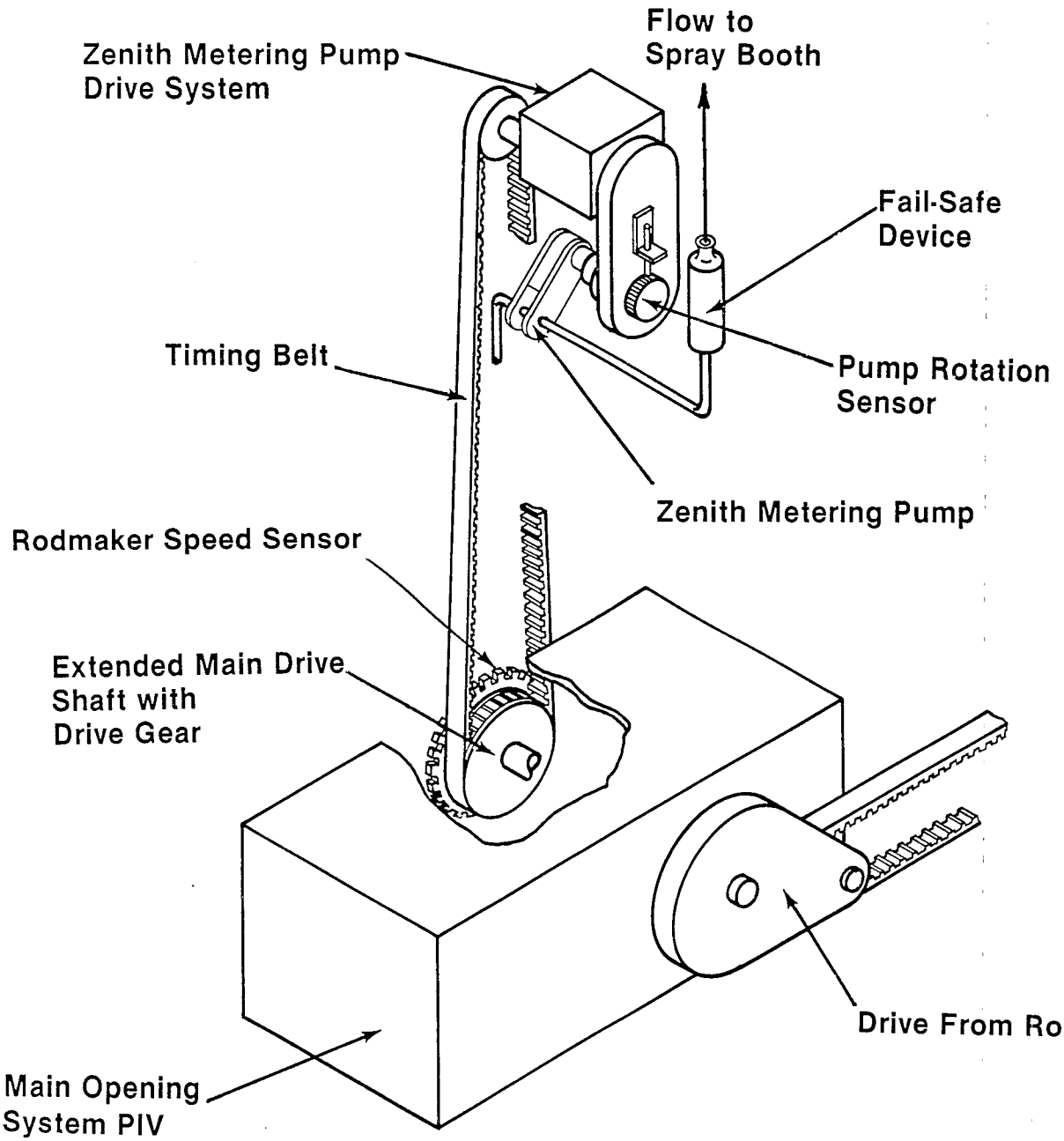
TRANSITION: Plasticizer droplets fill the spray booth. Droplets not taken up by the tow band begin to condense on the baffles inside the booth.

PLASTICIZER CONTROLLER



EQUILIBRIUM: Plasticizer droplets not taken up by the tow have condensed on the baffles and are flowing to behind the brush. Plasticizer is now being fed to the brush by the positive displacement pump and the recycle flow.

PUMP-DRIVE ARRANGEMENT



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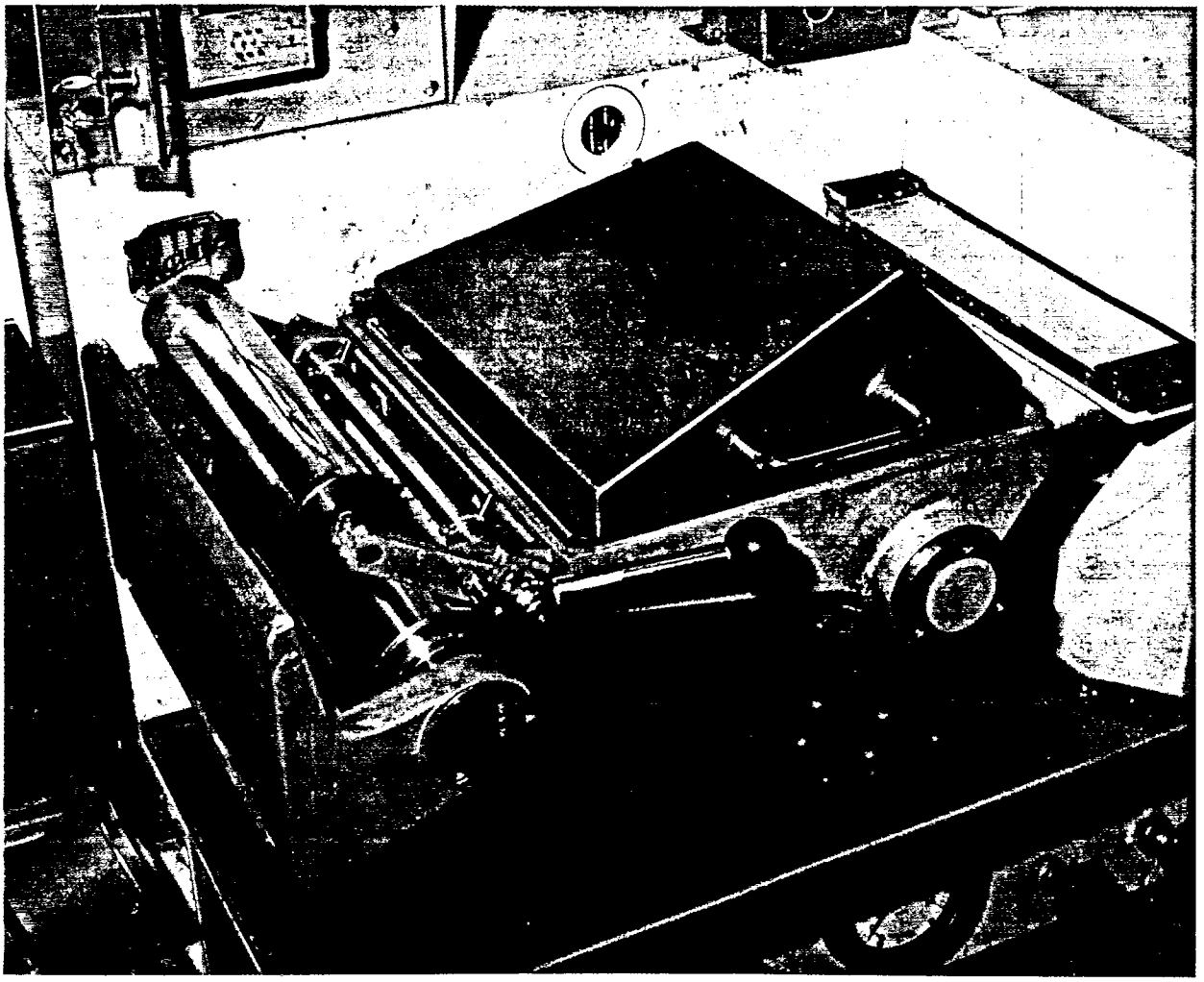
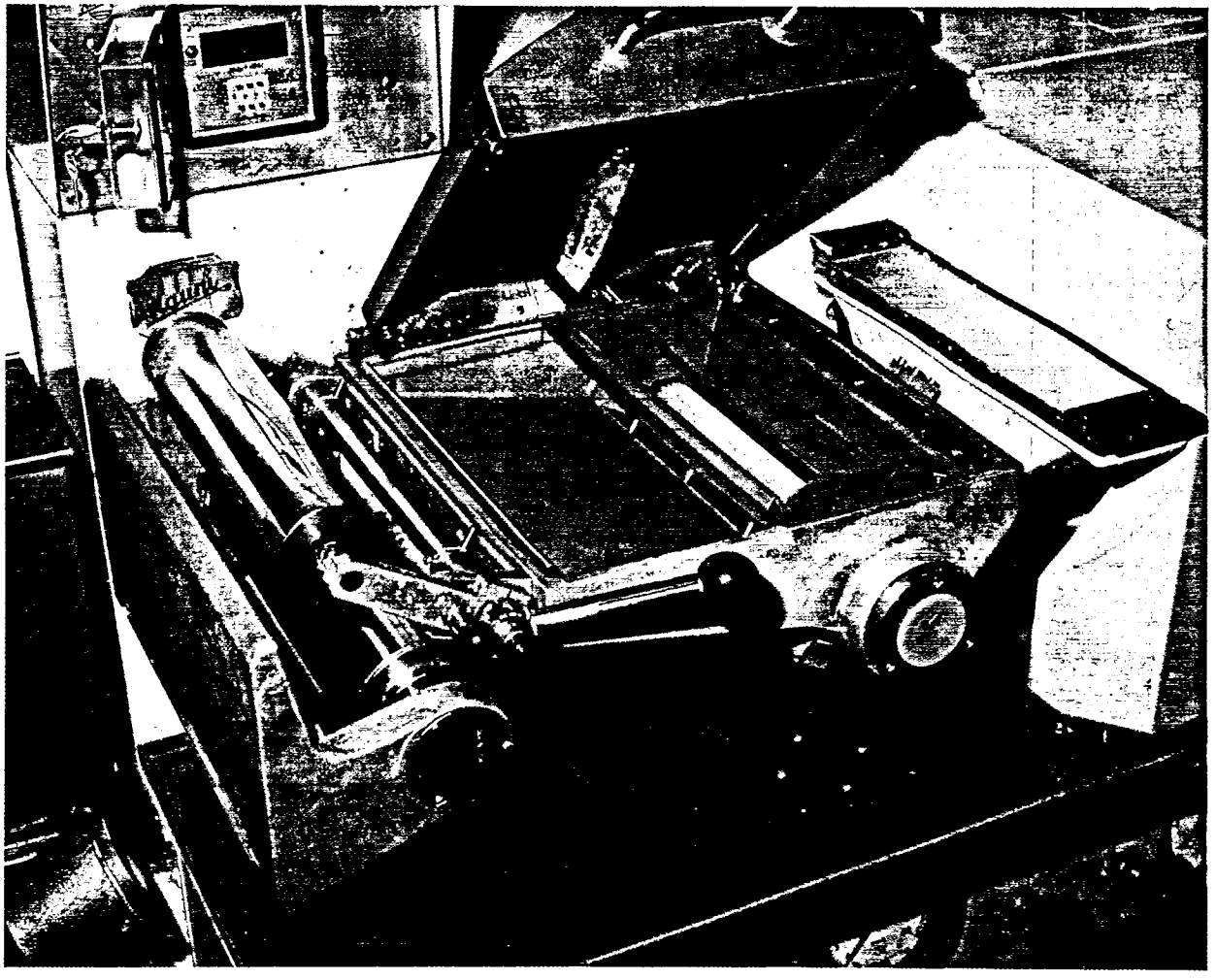
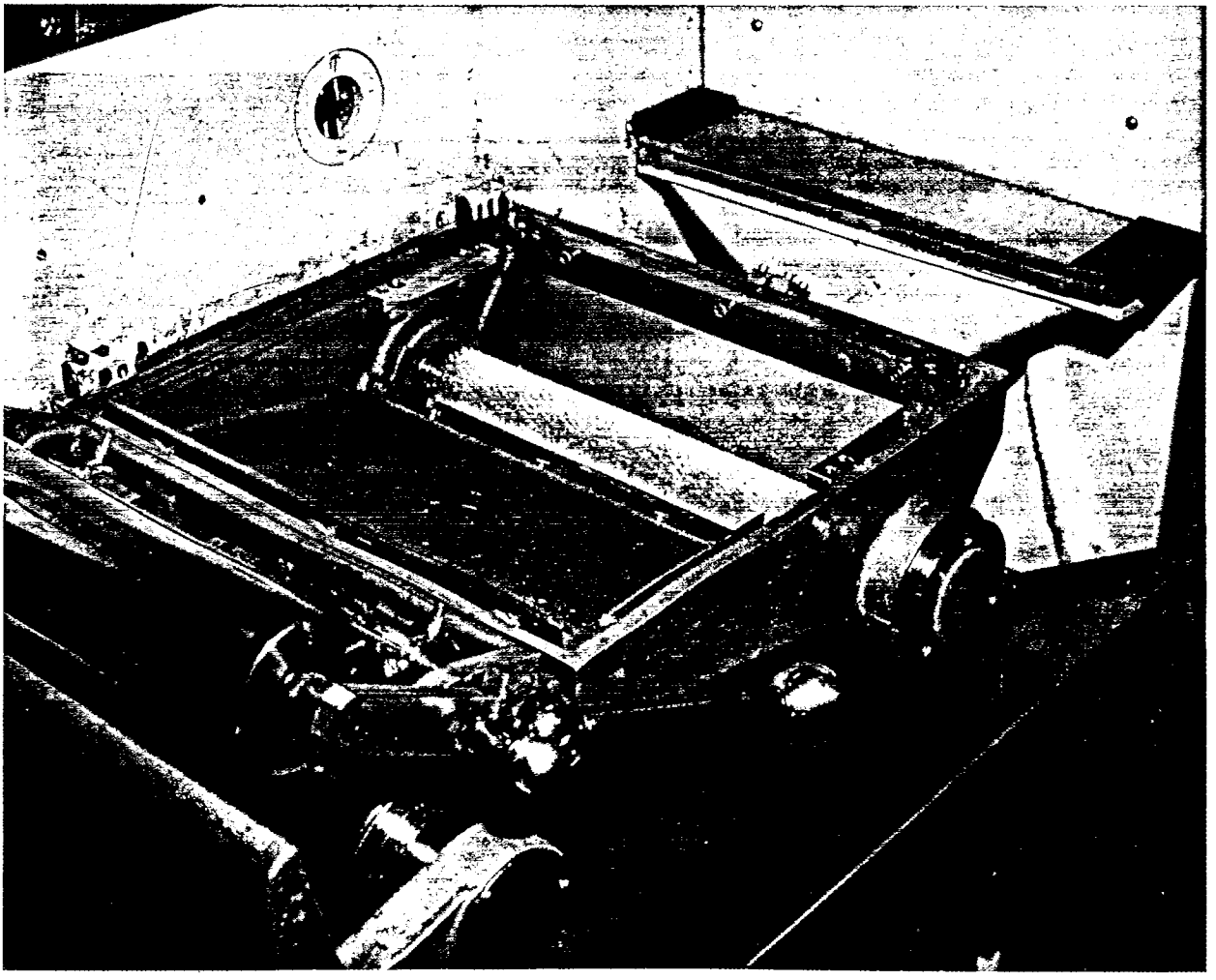
PLASTICIZER CONTROLLER SPRAY BOOTH



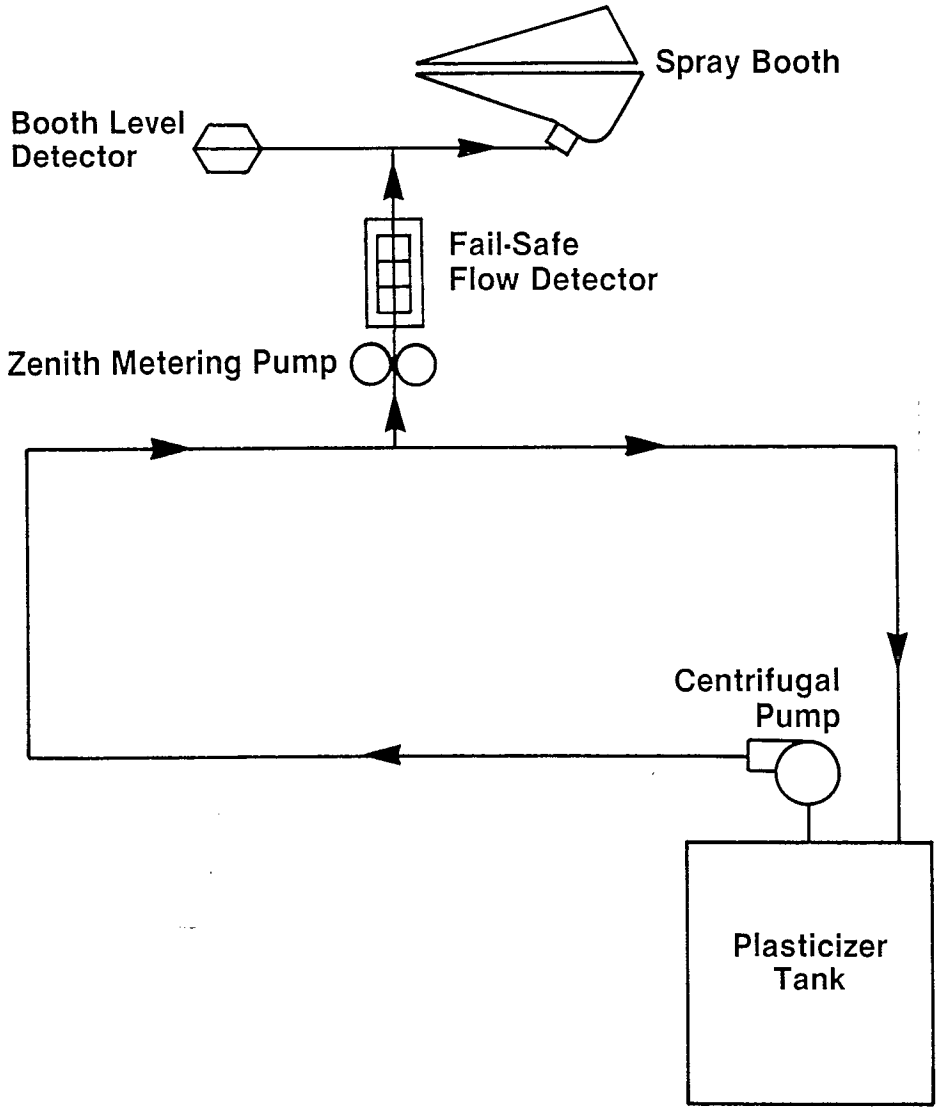
OPEN SPRAY BOOTH



LOWER SECTION OF SPRAY BOOTH



PLASTICIZER CONTROLLER
FLOW SCHEMATIC



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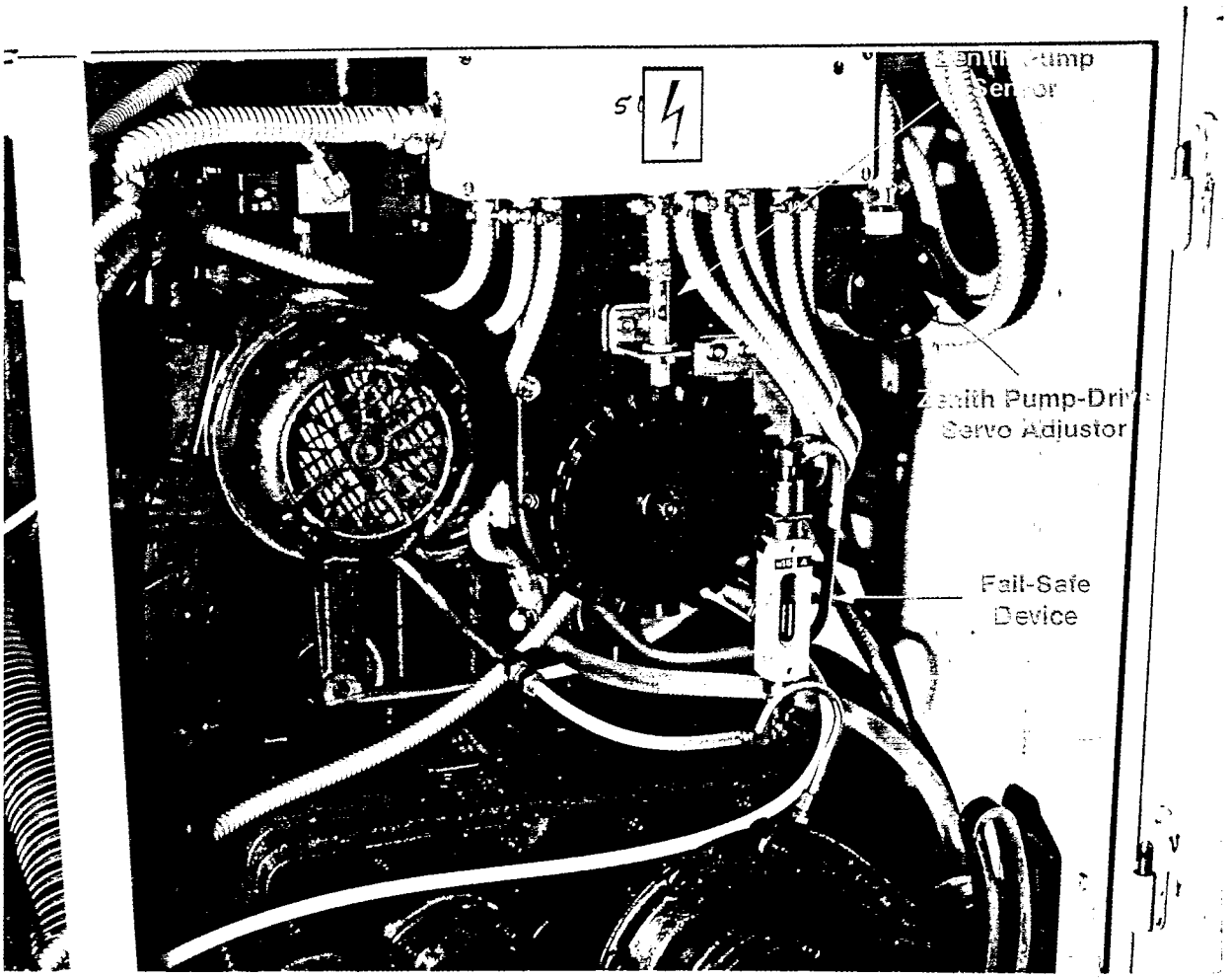
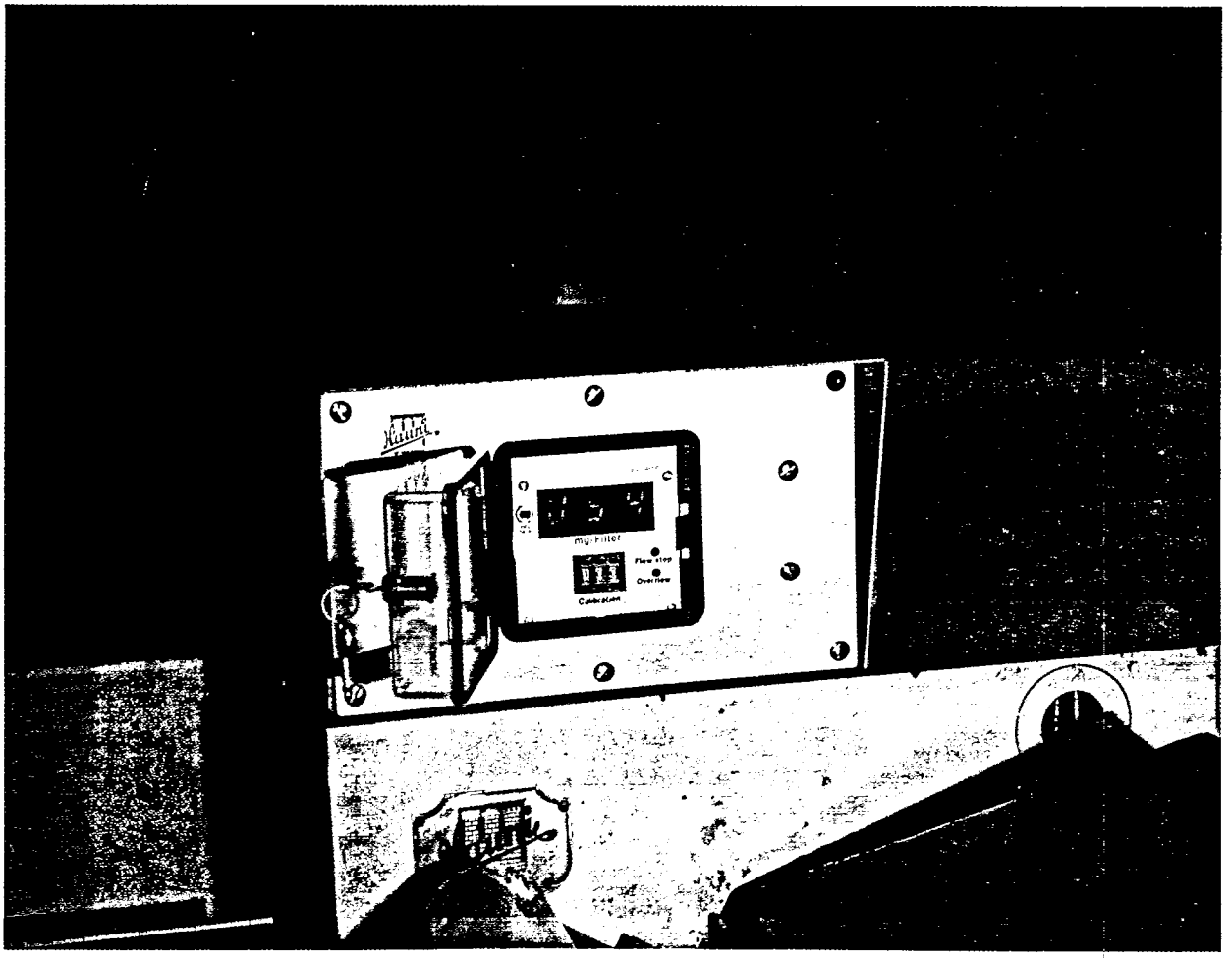
PUMP-DRIVE AND FAIL-SAFE SYSTEM



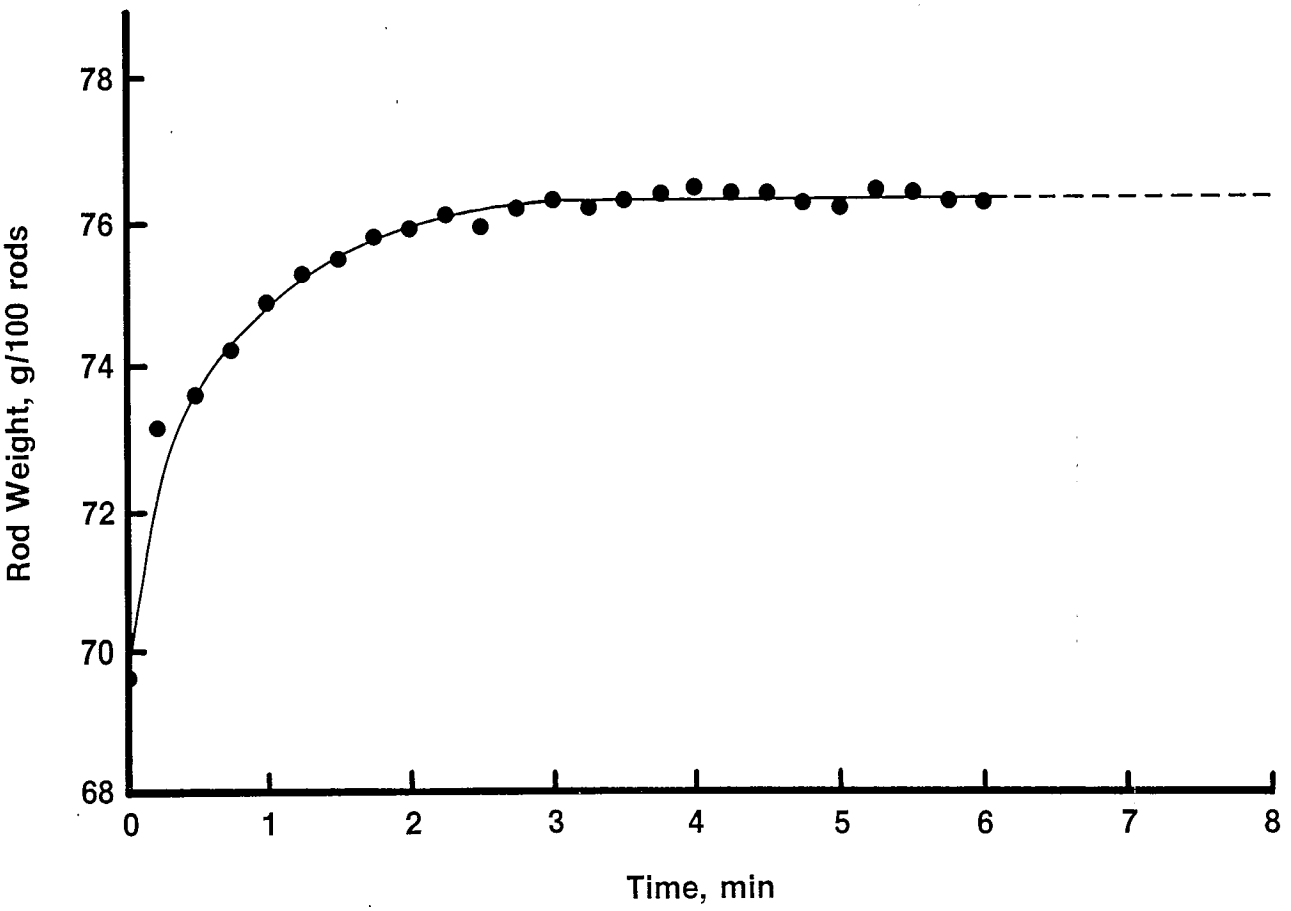
OPTIONAL DIGITAL READOUT



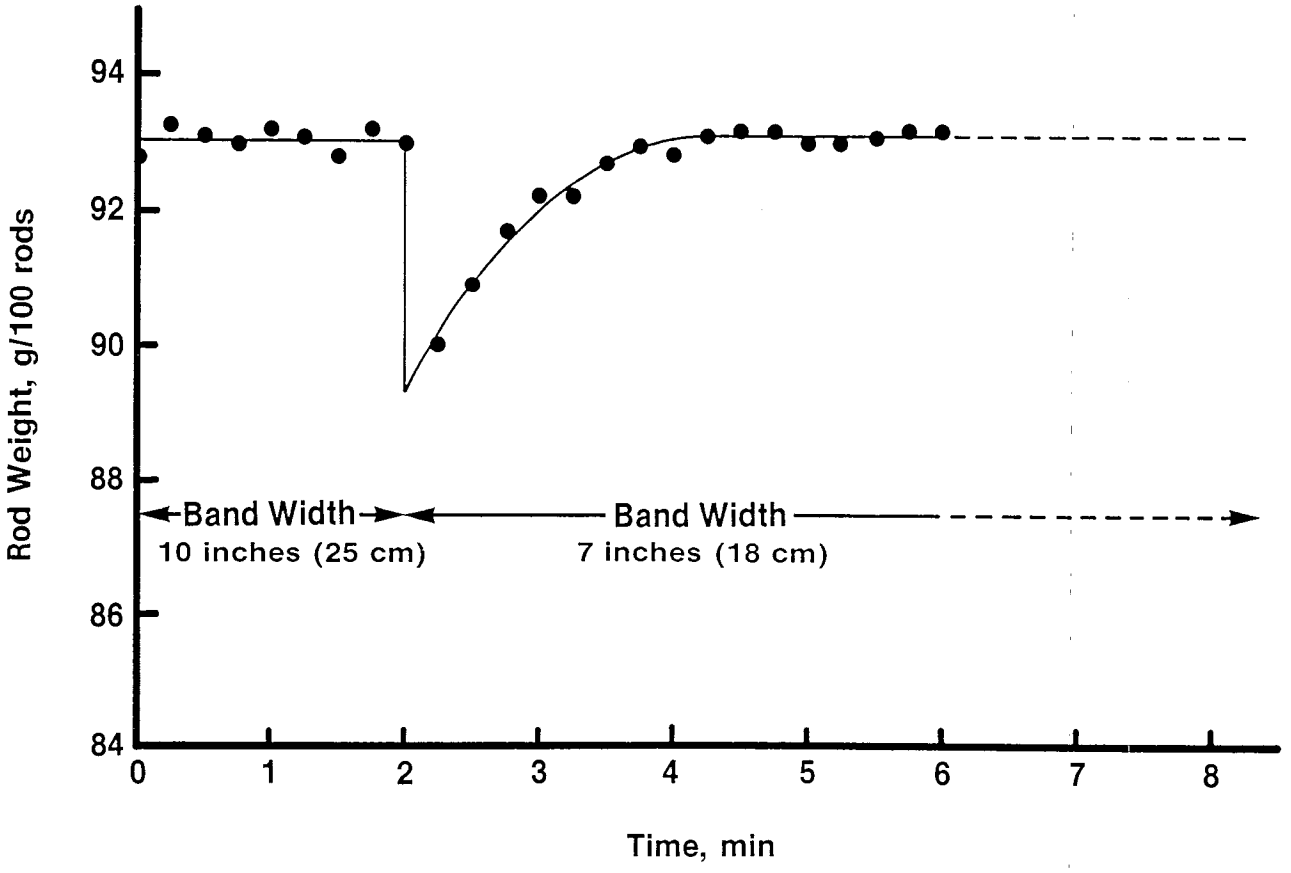
TRIAL PLAN

- Rod-weight equilibrium.
- Band-width compensation
- Individual rod variability.
- Effect of add-on level on firmness.

ROD WEIGHT EQUILIBRIUM



EFFECT OF BAND-WIDTH CHANGE



INDIVIDUAL ROD VARIABILITY

Individual Rod Parameter	Coefficient of Variation, % *	
	Band Width 10 inch (25 cm)	Band Width 7 inch (18 cm)
Weight	0.856	0.780
Pressure Drop	2.44	2.30
Circumference	0.185	0.155
% Plasticizer Add-on **	3.70	5.0

* Determined during equilibrated machine conditions at 400 m/min

** CV on all individual rods taken during mini-production run

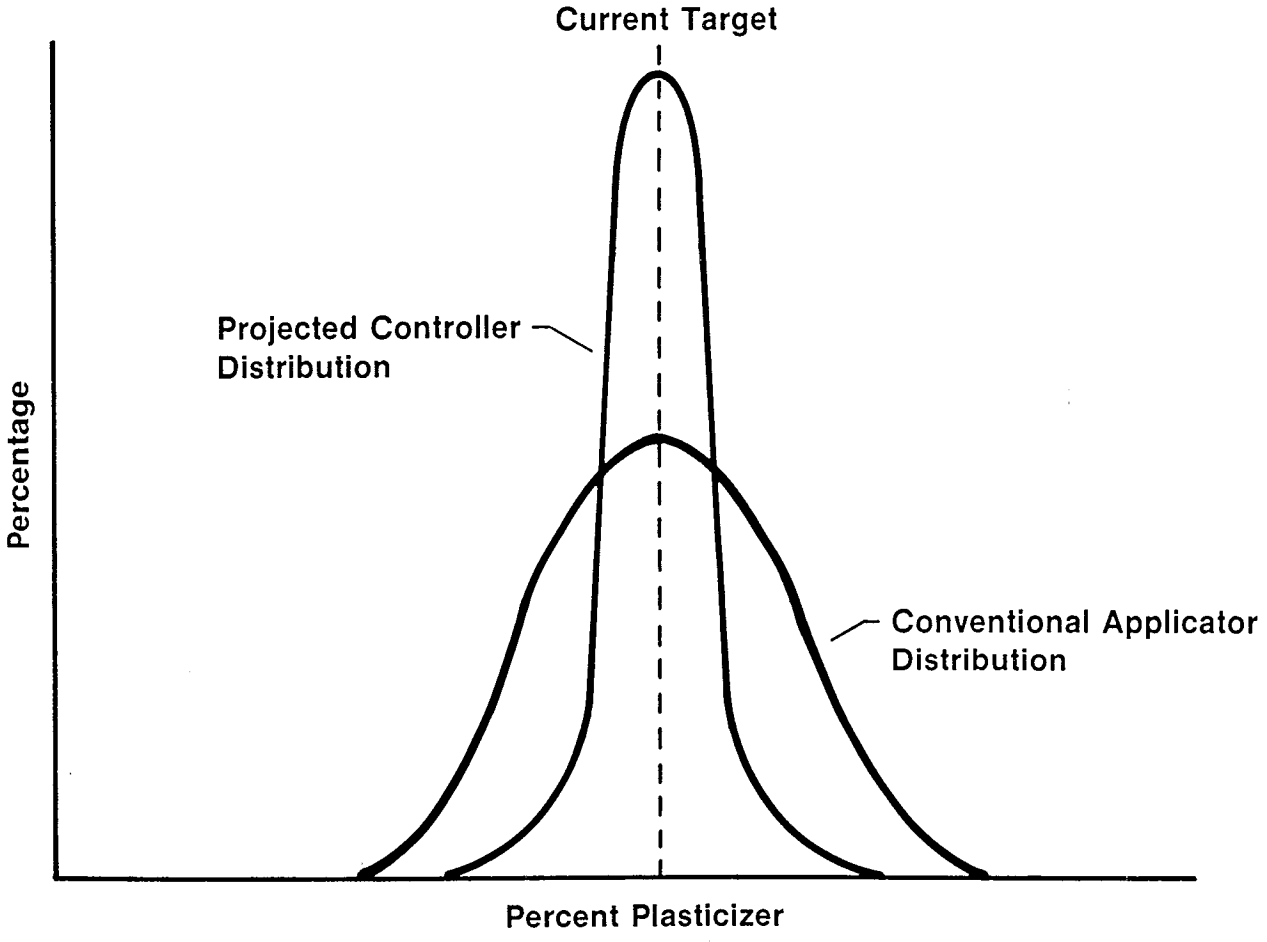
ROD FIRMNESS VARIABILITY

Plasticizer Applicator	Filtrona Firmness (%)	Standard Deviation (%)
Plasticizer Controller (nominal 7% triacetin)	90.8	0.96
Conventional Brush/Dip Roll (nominal 7% triacetin)	91.0	0.97

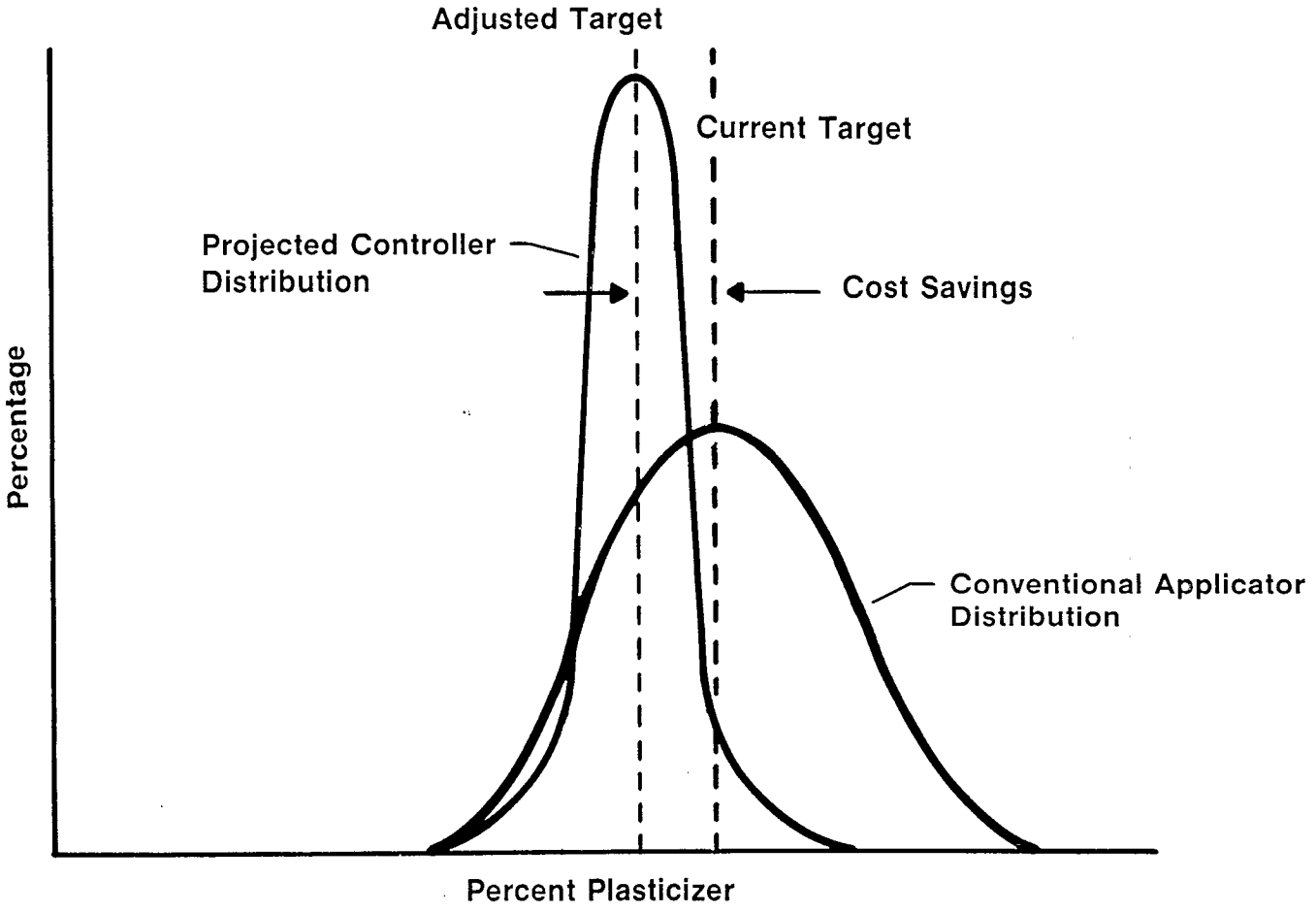
EFFECT OF PERCENT PLASTICIZER ON FIRMNESS

Plasticizer Add-On	Filtrona Firmness (%)	Standard Deviation (%)
Nominal 7.5% Triacetin (n = 16)	91.1	0.85
Nominal 9.5% Triacetin (n = 16)	91.6	0.72

PERCENT PLASTICIZER DISTRIBUTION



PERCENT PLASTICIZER DISTRIBUTION



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FILTER FACTS

VOLUME 5

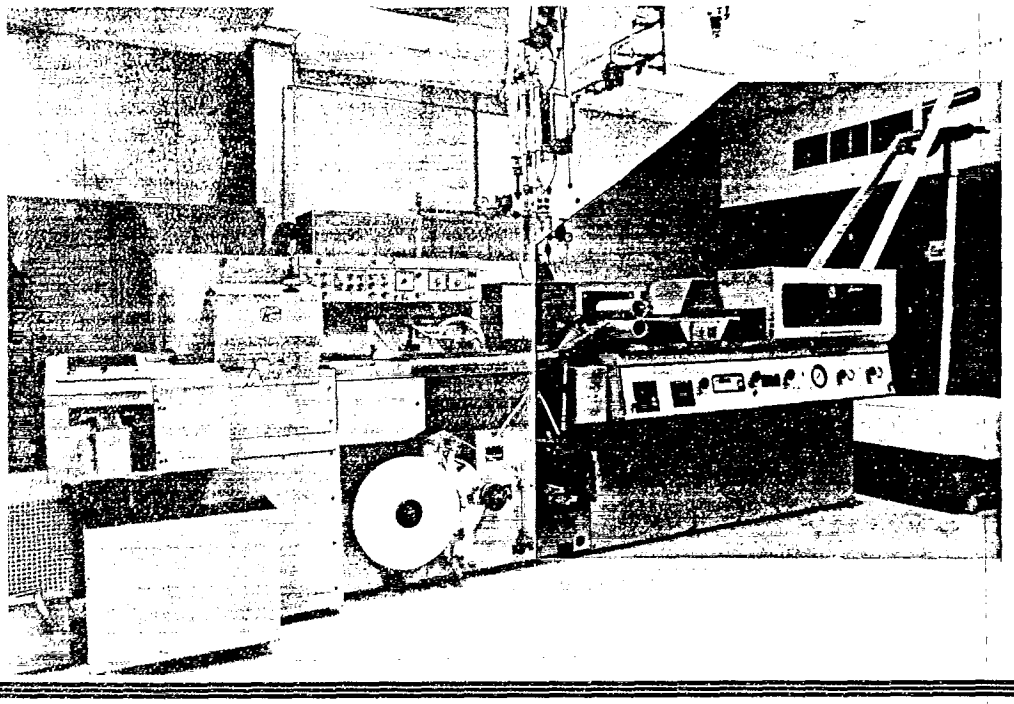
FROM THE PEOPLE AT EASTMAN

EASTMAN'S E-80 PROCESS

Eastman has designed a new tow blooming process, the E-80, that operates at speeds up to 600 meters per minute and provides:

- a high degree of filament separation and crimp retention
- extended capability ranges
- stable filter rod properties during speed changes
- improved plasticizer application
- low pressure pneumatic blooming

Eastman's E-80 Process Coupled to a Hauni KDF-2 Plugmaker



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HIGH SPEED TOW PROCESSING

Several manufacturers of cigarette-making equipment have introduced machines capable of manufacturing cigarettes at 6500 units per minute or faster. With these advancements, we anticipate that filter rod makers that will operate at speeds of 600 meters per minute will be developed in the near future.

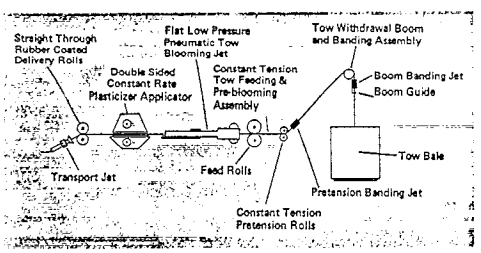
In anticipation of the development of high-speed equipment, Eastman conducted an investigation to determine the effects of increased filter tow processing speeds on filter rod properties. The speeds investigated ranged from 200 to 600 meters per minute. This study identified several problem areas that may be encountered at the higher operating speeds, such as reduced capability range and the change in rod properties as plugmaker speed changes.

A NEW TOW PROCESSING UNIT

Eastman has designed the E-80 process to overcome the major deficiencies of commercially available differential-tension-type, tow-blooming processes when operated at speeds up to 600 meters per minute. A process schematic of the E-80 process is shown in Figure 1.

Figure 1

E-80 Low-Pressure Pneumatic Tow Blooming Process



The tow is withdrawn from the bale and banded with two low-pressure banding jets before it enters a set of idler-type pretension-rolls. A set of driven feed rolls downstream from the pretension rolls applies uniform tension to the tow band to begin blooming or fiber separation. The E-80 pneumatic blooming jet receives the tow from the feed rolls, completes the blooming, and relaxes the tow in a bustle. A set of driven delivery rolls pulls the bloomed tow from the bustle through a dual-sided plasticizer applicator, then delivers the tow to a low pressure tow transport jet which forwards the tow to the garniture of the plugmaker.

The pretension rolls are of a low-inertia type. Accordingly, they are very responsive to changes in tow tension and effectively maintain a constant tension input to the feed rolls.

A smooth surfaced feed roll is used rather than a grooved or threaded roll. A smooth roll used in conjunction with pneumatic blooming provides a uniform extension of the entire tow band in the tension zone; is less likely to cause roll wraps; is easier to clean and maintain; and causes less wear on the surface of the mating rubber roll.

The E-80 pneumatic blooming jet is the heart of this new process. The inner construction of the jet is shown in Figure 2. Low pressure air enters the jet from both the top and bottom sides of the nozzle assembly and intermixes with the tow, pulling it tightly from the feed rolls and conveying it down the diverging throat assembly into a bustle. The tow rapidly decelerates in the bustle while the compressed air is allowed to escape through top and bottom vents. The individual filaments are bloomed by the compressed air as it expands and escapes from the bustle. The tow is pulled from the bustle by the delivery rolls.

Figure 2

E-80 Pneumatic Blooming Jet

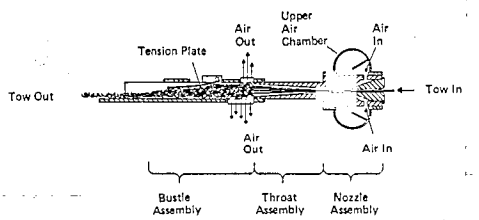


Figure 3 shows a sketch of the plasticizer applicator. Plasticizer is metered onto transfer rolls above and below the tow band by manifolds. The transfer rolls carry a uniform film of plasticizer to rotating brushes which propel plasticizer droplets at high-velocity onto and through the tow. The plasticizer is supplied to the system by positive displacement pumps that are driven by the plugmaker drive shaft so that the amount of plasticizer applied to the tow remains constant regardless of plugmaker speed. The constant width of the relaxed tow band combined with the double-sided applicator provides uniform plasticizer application over a wide range of plugmaker speeds, resulting in improved filter rod firmness.

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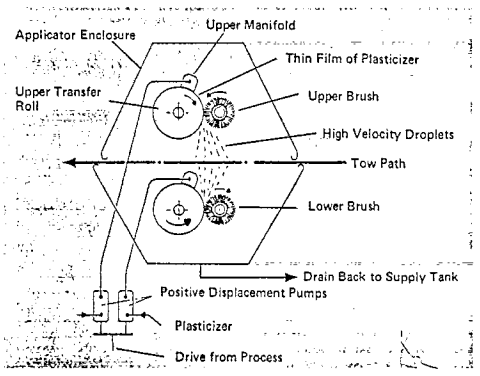
Figure 3

Double Sided Plasticizer Applicator



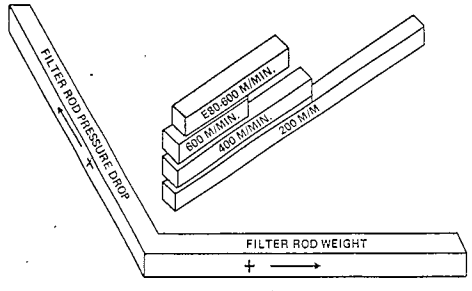
E-80 PERFORMANCE CHARACTERISTICS

Figure 4 shows the effect that increased processing speeds have on the capability range of typical tow specifications processed on equipment using a differential-tension type of tow blooming process and a tow transport jet. Examples of this equipment are the Eastman Miniature, the Hauni AF-1, and the Hauni AF-2 processes. In Figure 4 it can be seen that as processing speeds increase, the maximum points of the capability range are reduced while the minimum points remain relatively stable. At a processing speed of 600 meters per minute, a pressure drop range of less than 100 millimeters is typically obtained.

At comparable operating speeds, the E-80 has a longer capability curve than the differential-tension blooming processes. As shown in Figure 4, at 600 meters per minute, the E-80 tow capability curve has a slightly higher minimum point but is approximately twice as long as conventionally processed tows at the same speed.

Figure 4

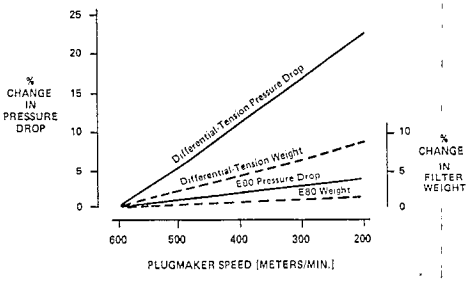
Effect of Plugmaker Speed on Capability Range



The stability of rod properties during changes in plugmaker speeds is better with the E-80 Process than with differential-tension-type processes. Figure 5 illustrates the effect that plugmaker speed changes have on filter rod weight and pressure drop when using a differential-tension-type process compared to the E-80 tow-blooming process. In addition to start-up and shut-down, plugmaker speed changes occur during plugwrap bobbin changes. Speed changes may also be initiated automatically to satisfy the varying demands of mass rod storage systems when they are utilized. If a differential-tension-type process is adjusted to obtain optimum bloom while operating at 600 meters per minute, and if the speed is subsequently reduced to 200 meters per minute, the tow will become underbloomed and the filter weight and pressure drop will increase, often beyond acceptance limits. The E-80 process is not speed sensitive and maintains more stable filter weight and pressure drop at target conditions during speed changes.

Figure 5

Effect of Plugmaker Speed Changes on Filter Rod Properties



SUMMARY

The E-80 process technology offers solutions to many of the problems of processing filter tows at speeds of 400 meters per minute and greater.

The pneumatic blooming used by the process ensures high degrees of filament separation and crimp retention. This results in optimum yield and adequate capability ranges at higher operating speeds. The dual-sided plasticizer applicator provides a uniform and constant application that will result in firmer filter rods. The process is not speed sensitive and maintains stable filter weight, pressure drop, and plasticizer application during speed changes.

Additional information on the E-80 process can be supplied through your Eastman representative.

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